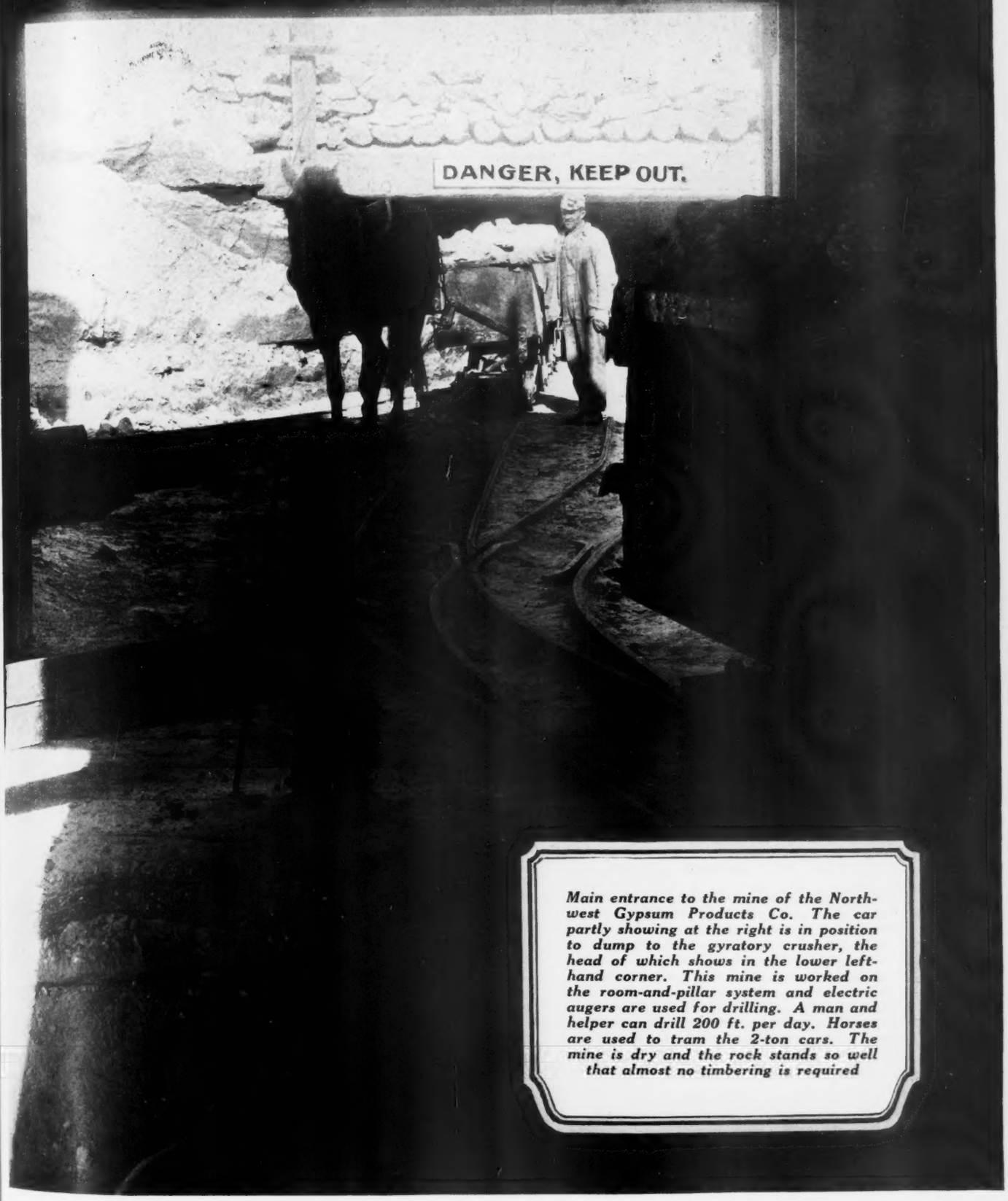
Volume XXX Chicago, March 5, 1927 Number 5

Rock Products

CEMENT and ENGINEERING NEWS



Main entrance to the mine of the Northwest Gypsum Products Co. The car partly showing at the right is in position to dump to the gyratory crusher, the head of which shows in the lower left-hand corner. This mine is worked on the room-and-pillar system and electric augers are used for drilling. A man and helper can drill 200 ft. per day. Horses are used to tram the 2-ton cars. The mine is dry and the rock stands so well that almost no timbering is required

Bird's-eye view of plant and storage yards of the Northwest Gypsum Products Co., Gypsum, Mont.

A Modern Gypsum Products Plant in Montana

Northwest Gypsum Products Company Makes Stucco and Tile for Large Northwest Sales Territory

By R. M. Calkins, Jr.
President, Northwest Gypsum Products Co., Lewiston, Montana

THE gypsum deposits between Heath and Forest Grove, or Gypsum, from eight to 20 miles east of Lewiston, Mont., were known and prospected prior to 1916, when they were reported upon by O. W. Freeman and C. F. Bowen of the United States Geological Survey.* There are several deposits in this section of Montana, both east and west of Lewiston, but that near Heath and Gypsum is one of the most extensive and purest. This gypsum bed is in the Ellis formation of the Jurassic age. It dips to the northwest at a low angle.

The Northwest Gypsum Products Co. began the construction of its plaster mill at Gypsum in the spring of 1921, and started manufacturing operations January 1, 1922. The plant is located approximately eight miles east of Lewistown on a branch line of the Chicago, Milwaukee and St. Paul railway.

The railway company traverses the southern border of the gypsum deposit, showing the outcropping of the gypsum in various cuts, exposing a face of over 1000 ft. The deposit lies horizontally and on the apex of an anticline, with receding slight dips from the main entry. There is fully 12 ft. of gypsum, 9 ft. of which are being extracted.

Mining Operation

The main entry has been driven into the face at right angles to the railroad track and in line with the plaster mill. From the

*Gypsum Resources of the United States, by R. W. Stone and others, U. S. Geological Survey Bulletin 697, published 1920.

tunnel at 150-ft. intervals have been driven cross entries with corresponding back cuts for economical operation and ventilation. Due to the main entry being upon the crest of the anticline, there is only a difference of 6 in. in elevation from the adit to the face of the main entry, some 700 ft. in, at present. The cross entries lie at right angles to the main entry and slope slightly away from the main entry. The mine is dry, with good roof and practically no timber is used. The room and pillar system of mining, similar to coal operation, is practiced.

Scranton electric drills are used for boring, and it is not infrequent that an experienced driller, with one helper, will make over 200 ft. of hole in an 8-hour shift, including set-ups. At present, horses are used for tramming the 2-ton capacity steel cars to the crushers.

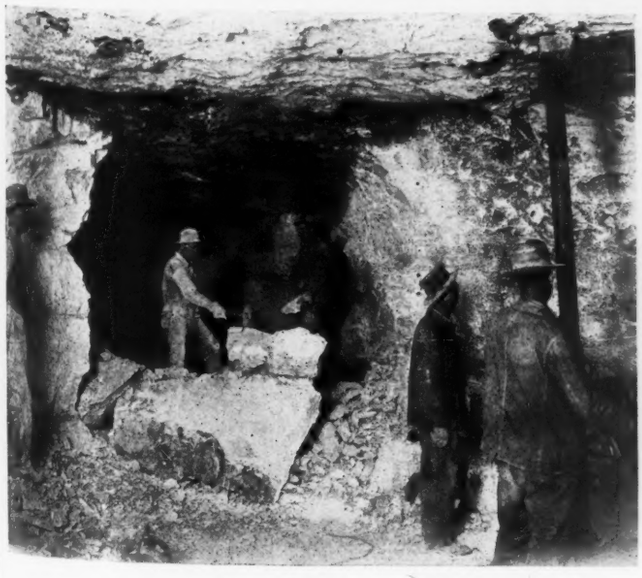
Power is supplied on the company's own transmission line from the Montana Power Co.'s sub-station six miles distant. At the mill the current is transformed to 440-volt, 60-cycles, a.c. At the mine entry there is a motor generator set, which changes the alternating current to direct current for operating the mine drills.

Milling Operation

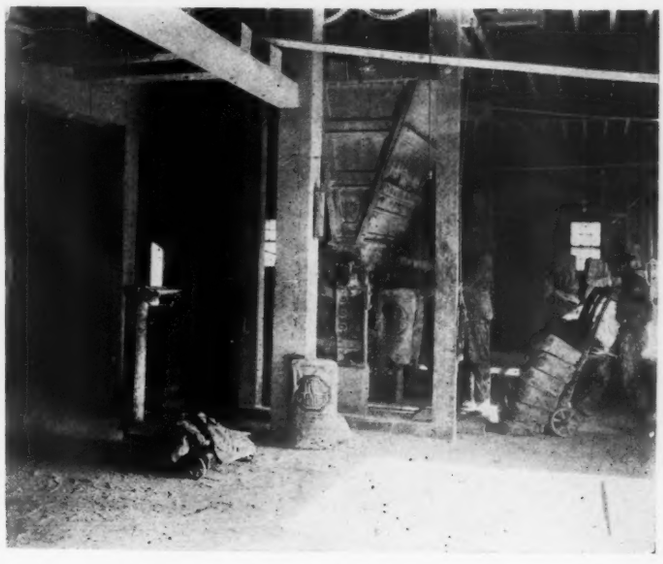
The mill buildings are constructed in the shape of a letter L, 120x30 ft. in width and 50 ft. from the peak of the roof to the railway tracks. The lower leg of the L mixing building is 76x46x50 ft. to the peak of the roof. The top of the L is at the mine entries to the bottom leg of the L, parallel to the railroad tracks. The rock is brought by cars and dumped into a Gates gyratory crusher, where it is reduced to 1½-in. size.

From this point it can be either taken by a 120-ft., 18-in. conveyor belt to a spout for loading cars with crushed rock, or diverted through an 8x50-ft. Allis-Chalmers dryer. At present this dryer is superfluous as the rock coming from the mine does not need drying,

Plant interior showing conveyor belt for crushed rock gypsum and section of calcining department. Crushed rock storage bins and cooler pits appear in the foreground. The calcining kettle and dust collector show in the rear



Electric auger drilling in a mine room



Portion of the sacking department

The outcropping of gypsum occurs in various cuts, exposing a face of considerable depth. The bed is horizontal and about 12 ft. thick, 9 ft. of which are being extracted

but in the event that water is encountered at any place in the mine it will serve its purpose. At the end of the dryer the rock is delivered to a bin from which the four-roller Raymond mills are fed. The rock is pulverized to 92% through a 100-mesh screen.

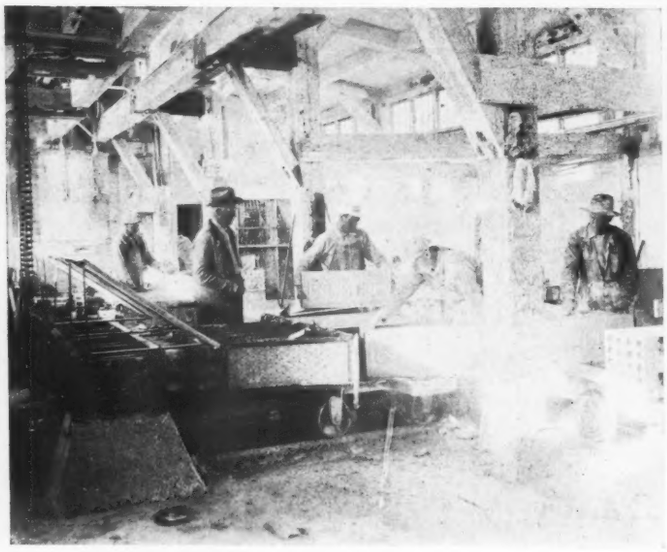
The Raymond mill discharges the pulverized gypsum into bins located above two 9½x10-ft. kettles. From these bins it is then fed into the kettles as desired, where it is calcined. The kettles are elevated so that in dumping they discharge directly into cooler pits from which the material is taken; then, at right angles to its previous direction, it is elevated and conveyed to storage bins. From the mixing department on the second floor, where it is mixed with retarder and fiber, it is discharged into Broughten mixers and thence directly into a Bates valve bag machine. The bag machine faces the track doors so that the truckers handle it directly from the sacking machine by the shortest distance possible, to the cars for loading.

Separate Motor Drives Throughout

Each operation in the mill has its own motor, there being a minimum of elevating machinery in the plant, as the crusher is 45 ft. above the main floor of the mill buildings. All material moves directly in a straight line, by gravity, from the main entry until after calcination, then at right angles to the mixing department.

At this point it can either be thrown into a large storage bin or carried directly over into a small storage bin from which it is drawn for the manufacture of gypsum tile. The gypsum tile manufacturing building adjoins the mixing department, paralleling the railroad tracks. This building is constructed of two walls of 3-in. gypsum tile with stucco poured between. The roof also is of gypsum and poured in place. The building is 100x40 ft. and 14 ft. at the eaves.

In manufacturing gypsum tile the Pipe machine is used. The material is made in batches for pouring, water and stucco being weighed automatically and fed into a mixer which travels over the molding machines. After the blocks have been molded and set they are loaded on to small cars and either taken to a mechanical oil burning dryer or taken to open-air drying racks which are built out and over the brow of a hill. The prevailing winds pass up the valley, strike this hill and are then forced upwards and through the drying racks. As Montana weather is usually very dry, with little humidity, blocks will dry frequently in 90 hours. They are then taken from the drying racks and piled for storage.



Section of tile department showing take-off end of tile machine

Corner of the physical and chemical testing laboratory

Water Supply

The water supply for domestic purposes is served by piping spring water which rises above the gypsum beds by gravity and is therefore fit for domestic purposes. The water used in manufacturing is pumped from the creek below the mill to tanks just above the mill buildings. From there it is drawn by a gravity line as needed. Water is pumped to two large storage tanks from which it can be discharged through a 4-in. line to any part of the mill and to fire hydrants located about the property and in the village below, with a pressure of 80 lb., by a positive gravity system, as against a high pressure pumping system which might fail at a critical time. The fire tanks are located 200 ft. above the mill buildings.

There is a fireproof building constructed of gypsum tile for the manufacture of wood fiber, picking of hair and manila fiber, also several small buildings for warehouse purposes and storage in addition to the company's plant office and laboratory.

The speed with which material can be moved through the plant, due to its design, gravity and absence of elevators, makes it unnecessary to carry a large stock of manufactured products on hand. With the mine located as close to the mill building as it is, it has been found better to maintain storage in the mine where it is at all times accessible as against large storage bins and additional overhead in partially manufactured products. In this manner fresh material is shipped promptly to the customers and allows them to keep fresh stocks on hand at all times. While the distances are great, the service rendered by the railroads in the northwest is excellent, as five days is very nearly the limit for shipments from Gypsum, Mont., to its furthermost customers.

Facilities for Employes

In addition to the buildings above described, the company maintains a bath house, with shower baths and lockers, and while it is the statement of other concerns that this is not appreciated, this company finds that the men make constant use of the showers. A boarding house and cottages with a bunk house are provided for the employes.

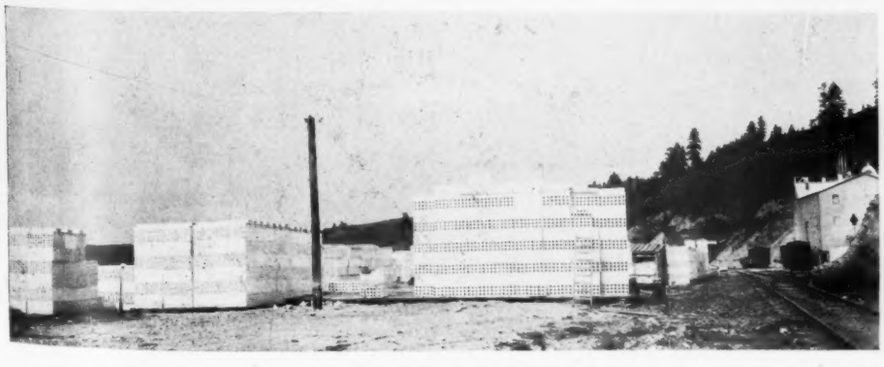
In the calcining process coal is used at present, although the plant is equipped for oil burning, but due to the present high cost of fuel oil as compared to coal, the coal is cheaper.

The mine is well ventilated by air shafts and forced ventilation is unnecessary.

Personnel

R. F. Turnbull, superintendent of the company, has had many years of experience in mining and operating smelters, which has given him technical experience which is exceedingly beneficial in operating a gypsum mine and plaster mill. G. J. McEntyre, vice-president and general manager, has been engaged in the plaster business for the past 26 years. Mr. McEntyre is now located in Seattle in charge of the company's sales on the Pacific coast. A. J. Nicholson is in charge of the sales in the states of Idaho, eastern Oregon and Washington, Montana, Wyoming and the Dakotas. The general office is located at Lewiston, Mont., in charge of R. M. Calkins, Jr., president and treasurer. The company also maintains a laboratory in charge of T. O. Caldwell. Each kettle batch is tested and frequent tests of all faces in the mine are made. Raymond mill tests are run constantly. The equipment of the laboratory includes general apparatus for making ordinary chemical analyses, Fairbanks testing machine, crusher, pulverizer, Southard viscosimeter, etc. In this manner the product is kept uniform and before a shipment can leave the plant it has to have the chemist's approval.

Drying gypsum tile on open-air racks built out and over the brow of the hill



Piles of dried tile in the storage yard

German Lime Industry in 1926

PRODUCTION of lime in Germany during 1926 was about 3,611,000 tons as compared with 3,811,000 tons in 1925, according to *Baumarkt*. This is only about 33 to 35% of capacity production, as the potential capacity of the country is considered to be about 11,000,000 tons annually. Production of limestone also decreased about 800,000 tons over the previous year. As a result of this many lime-kilns did not operate at all during the past year.

Building operations declined, and since they are the largest individual consumers of lime, the effect on production was quite noticeable, the 1926 consumption from January to October being about 150,000 tons behind that used in a like period in 1925. The British mining strikes increased German iron and steel production and thus made it more profitable for the limestone producer to sell flux stone instead of making lime. In general the price of lime was about the same as the past two years. Exports, with the exception of dolomite lime, showed a pronounced decrease. Imports of both lump lime and hydrate increased over the previous year, while ground lime and limestone declined.

Dredge of the Lenawee Sand and Gravel Co. in action

Unusual Dewatering of Dredge Discharge

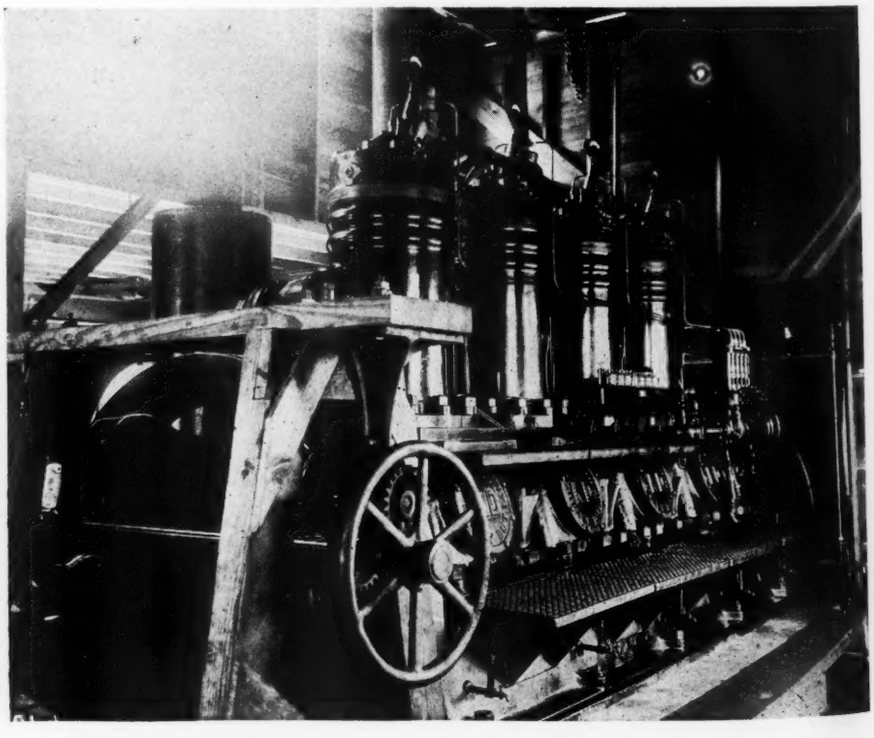
Lenawee Sand and Gravel Co. Uses a Settling Box Before the Plant Conveyor

THE Lenawee Sand and Gravel Co., Tecumseh, Mich., operated with a cableway dragline excavator until last summer, when it changed to a dredging operation on account of the need to work over a wider area. The deposit is about 70 ft. deep, half of this depth being below water level. In order to work the bank above water without danger of landslides, and also to provide a uniform feed to the pump, a combination method of sluicing and pumping was adopted. The dredge was built to provide pressure water for sluicing as well as to serve as a suction dredge of the regular type.

Oil-engine power was chosen for driving the pumps on the dredge on account of its low cost. An oil engine was also installed to run the machinery in the washing and screening plant. Instead of using this with a generator and motors for each machine, the now unusual method of transmitting power by a rope drive was installed. After some months' service the drive has proven satisfactory and the decision to use it has been justified.

The dredge hull is 65 ft. long and 30 ft. wide. The 240-hp. Anderson oil engine which drives all the machinery on the dredge is on one side of the center line and aft. The remaining machines are on the other side of the center and forward. This is the only arrangement that balances the weights and at the same time gives proper length of centers for belt drives.

The oil engine is placed on a reinforced concrete slab extending across the hull. This slab also carries the pillow blocks which hold an extension of the engine shaft on which are placed two large clutch pulleys.

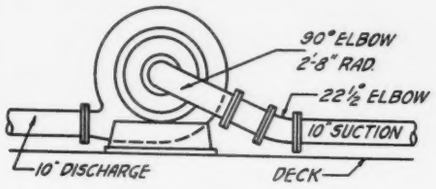


Oil engine on dredge which is connected to the pump through a clutch pulley. Another of the same type is used in the plant

One of these carries the main pump belt, the other a belt for driving the auxiliary machines through a short secondary shaft.

The pump is a 10-in. "Diamond" manganese steel pump and is furnished with a 45-ft. cutter of the chain type. All the main wearing parts of the cutter are of manganese steel. Both were made by W. H. K. Bennett, Chicago. For handling lines there is a 3-drum Clyde hoist, belt-driven. For priming the pump and furnishing pressure water to the gland of the dredge pump there is a centrifugal pump of the pressure type with a 2¼-in. discharge. A second pressure type centrifugal pump with a 4-in. suction and 3-in. discharge furnishes water for sluicing the bank. This water is discharged through a "gun" or mounted nozzle which is placed on the upper part of the A frame.

The disposal of the pump discharge and the method of dewatering it and conveying the solids to the screening and crushing plant are almost unique in sand and gravel practice. The pump discharge goes into a flume which runs over five 12x12-ft. settling boxes 15 ft. deep. Gates in the flume allow any box to be filled, or two or even more boxes to be filled at the same time. An overflow trough runs around three sides of each box and carries off the excess water. By having this overflow on three sides the "velocity of approach" with which the water flows to the overflow is reduced to where it will not carry any sand that it is desired to save.

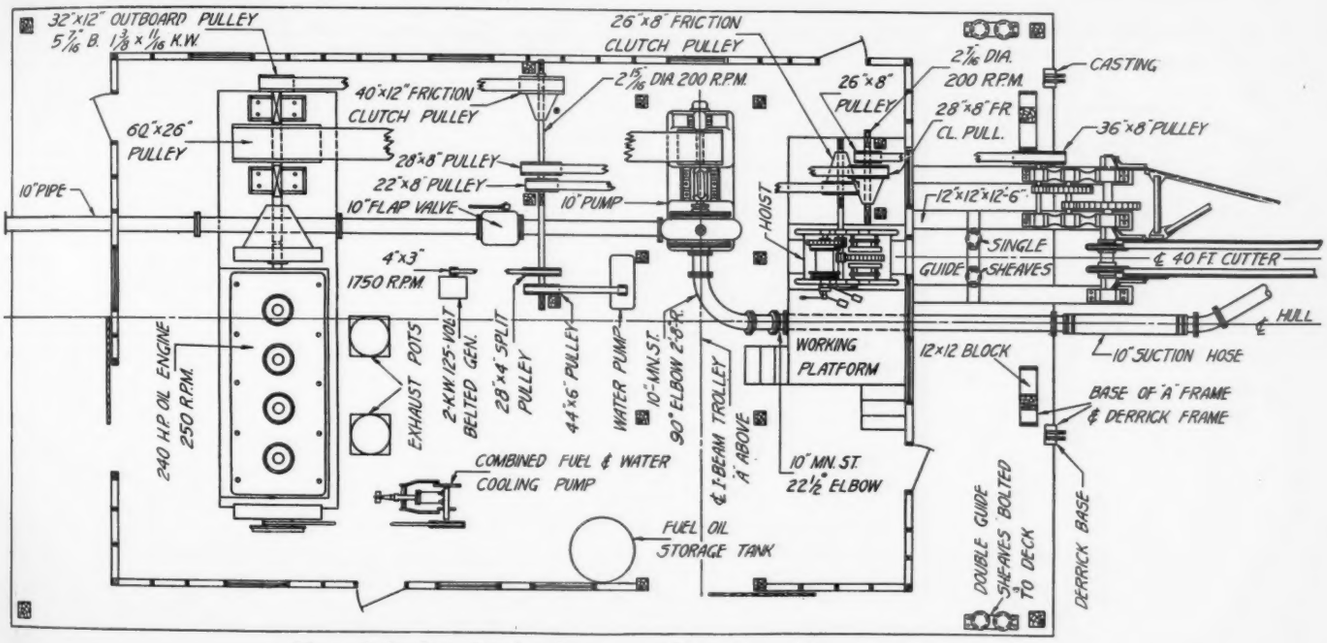


Showing setting of pump

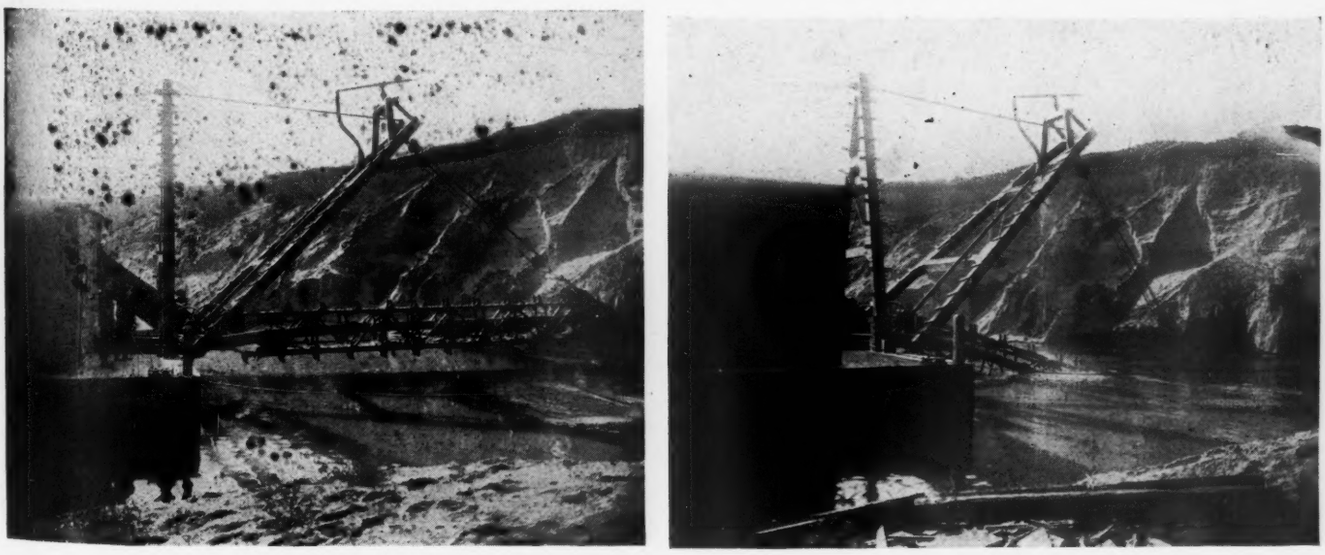
In the bottom of each box is a drainage, the entrance to which is covered with a coarse gravel filter, and this takes out the greater part of the water remaining with the sand and gravel after the box is filled.

Gates at the side allow the settled and dewatered material to run out on a 24-in. conveyor 620 ft. long, made by the Weller Manufacturing Co. The material is dry enough so that no water runs off the lower end of the belt, even though this has a considerable incline.

It is interesting to compare the method of dewatering in settling boxes described above with other methods in use. Some of these are: Pumping to a sump and excavating the settled material with an elevator of the digging type; dropping the pump discharge into the water near the plant and digging it out and lifting it to the screens



Plan of dredge showing how everything is run from one power unit



The cutter raised and lowered. Note nozzle mounted above the A-frame

by a cableway dragline excavator, a derrick or a crane; pumping to a dewatering sump on land and digging the settled material with a derrick that discharges to a hopper over a conveyor belt; pumping to barges and transferring by derrick to a hopper over a conveyor belt; pumping to a sump which is over a tunnel in which a skip runs; pumping to a dewatering screen at the head of the plant. The settling boxes just described would seem to be as simple as any of these and to require about as little labor as any, since one man attends to them.

The best way to run such a set of boxes is to fill all but one before shutting down at night, giving the plant plenty of drained material to start on. While the empty box is being filled by the pump its neighbor is being emptied by the conveyor, and as soon as the first box is filled this second box is ready to receive the discharge. The remaining boxes are emptied and filled in rotation, which gives the box first filled ample time to drain before it is emptied.

The screening plant contains six 96-in. Dull conical screens, of Link-Belt make, arranged in two lines. The perforations are of 2½-in., 1¼-in. and ¼-in. diameters. Oversize of the 2½-in. screen goes to a 9x16-in. Ersham jaw crusher, which is mounted on top of the bins just below the screens. A short elevator lifts the crusher discharge to the belt which feeds the screens.

The bins are concrete silos, 20 ft. in. diameter. Two of these are 40 ft. high and three are 30 ft. high. They make a good solid foundation on which to mount the screens and the crusher. Chutes from these bins are arranged so that any mixture of sizes may be made, such as two sizes of gravel and one of sand, or two or three sizes of gravel in varying proportions. The plant can be lighted for night work from a generator driven by the plant engine, an Anderson oil engine of 180 hp. There is another generator on the dredge so that it can work at night.

Little labor is required for this operation. There is a pump man and his helper on the dredge, two men on the settling boxes, one on the screens, one to attend the crusher and conveyor belt, one to take care of the plant engine and car puller, and two loading and coopering cars; nine men in all. The output is regularly 20 cars per 10-hr. day. Shipments are made on the Detroit, Toledo and Ironton railway.

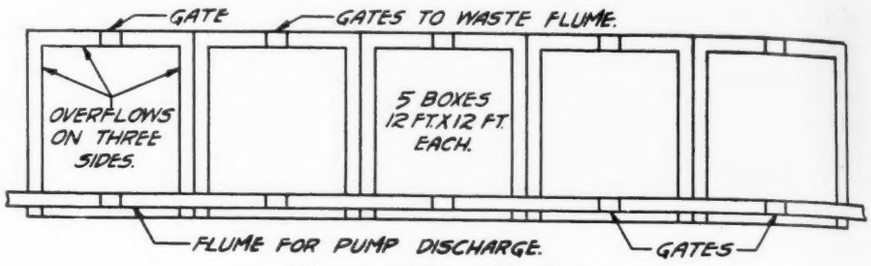


Diagram of the settling boxes

All the engineering and the designing of the plant was done by W. H. K. Bennett, Chicago.

The officers of the company are as follows: President, S. J. Wilson, Holloway, Mich.; vice-president, F. J. Blouch, Holloway; secretary-treasurer-manager, Ira W. Ashley, and plant superintendent, Charles Thurlby, both of Tecumseh.

Unfortunately the photographer chose a time when waste from the oil tank was being burned to take this picture of the plant

Panorama view of the Nazareth Cement Co.'s cement mill at Nazareth, Penn.

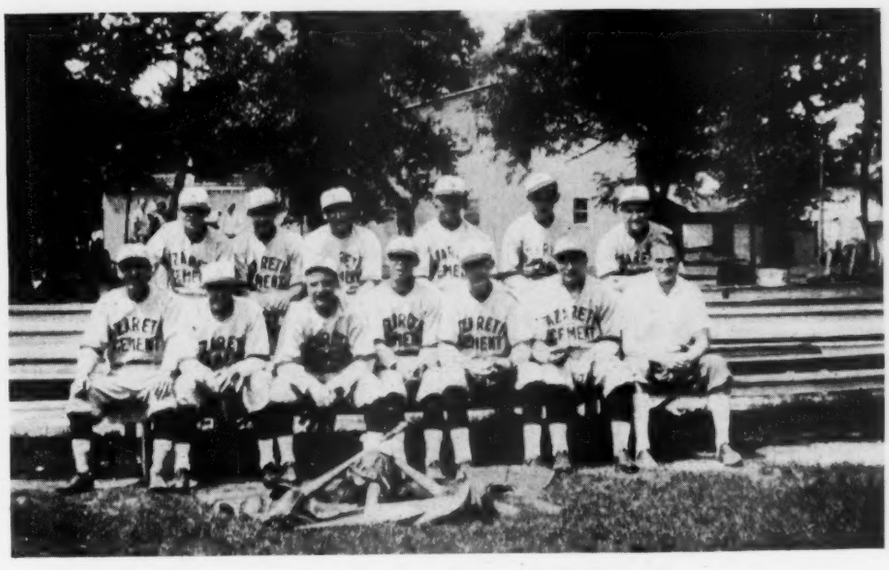
Personnel Organization of the Nazareth Cement Company

By Richard C. Lounsbury

AN expert cement manufacturer has recently stated that in principle the industry has nearly reached the height of mechanical development, and future progress will be made largely in the direction of low cost production through strict attention to the problems connected with efficient personnel and methods of management. In confirmation of this statement, the October 2 issue of ROCK PRODUCTS contains the following opinion of an English quarry engineer, A. B. Searle, who says: "No longer is quarrying a pleasant hobby for a landowner aided by a good foreman. A solution to the problem can only be solved by a greater employment of the powers of management applied on a far larger scale, with a much wider outlook than is at present common in quarrying."

Whether or not these opinions are to prove true is a matter which only the future can decide. However, it must be conceded that the cement and quarry industries have developed so fast during the past few years that the weight of engineering problems has restricted attention, leaving little time to attack the problems of efficiency and welfare of cement mill personnel upon a scientific basis. In the past education has been lacking concerning hazards common to this type of industry. However, coming down the home stretch we have not been left far behind, and in many instances cement mills and quarries have covered themselves with glory, even surpassing that of the pioneers in the industrial world who first attacked this difficult problem, although praise and much fine gold can never reward those pioneers who first took their stand against policies of the earlier industrial regime.

The task of mechanical protection and education of men to prevent accidents, at first appearing insurmountable, has been comparatively simple, when one remembers the results obtained in the short period of five or six years. The difficulties to be met have been reduced probably 100% by the increased use of simpler types of machinery, and now practically every cement and quarry operator has awakened with a pleasant shock to find that effective action applied to this problem has really landed him somewhere along the road to success in cutting down accidents. Increased efficiency within certain organizations has proved this to be worth while. Even the cynical old-timers, typical one-track production wizards, second only to God Almighty in their ability to create gold dust from cement rock and limestone, have come to the point of believing that perhaps this safety first business is of quite some importance after all. When such men are convinced that accident prevention pays, the battle is half won. Their cloak of cynicism is a tough old hide, but once the safety first can-opener makes its way through to their hearts, more fast friends of the movement have joined the ranks.



Baseball is one of the many recreations provided by the Nazareth Cement Co. The company team shown above is picked from seven department teams

In looking over

minutes of past safety meetings it is apparent that suggestions for guarding machine hazards were plentiful. However, when breakdowns occurred, guards were often removed and not immediately replaced in the haste to "get the mill going," the slogan on the lips of every foreman. The factor of making haste slowly was not there; education was lacking. One day the foreman of our repair gang, tired of replacing guards which others had thrown aside, suggested printing the words "Don't Forget Me" on the side of each guard. Simple, wasn't it? Practical? Yes; it worked! Now seldom is a mechanical safeguard found out of place.

Educating Men to Safety

This brings us to the matter of education. Prior to 1925, so nearly as I have been able to find by digging up all old safety records and listening to yarns which men like to tell, the safety committee meetings had missed the vital point, *education!* Suggestions to protect men from hazards of revolving machinery had been carried out to some extent, but the number of accidents did not decrease. In fact, two of our most severe accidents in 1923 and 1924 occurred where guards were in place. One man lost an arm and another a hand while oiling machinery. They had not been taught to do this job the safe way. During July, 1925, a new foremen's safety committee was formed, a complete inspection was made by three of its members, who turned in a report of mechanical safeguards to be installed. However, because of a reconstruction period just ahead, little time was found to carry out the many suggestions noted on this report. There was only one alternative—educate the men to think *how* to prevent an accident before tackling a job. At this time a further step was taken in teaching men to report immediately to the company's dispensary for treatment of all minor injuries or sickness. Here, J. P. Matthews, a thoroughly competent graduate nurse of long experience in government and private hospitals, began a course of work which the men now, I believe, respect a great deal, and largely because of the fine personality and knowledge possessed by our good friend "Doctor Jack," as he is called.

This education proved highly valuable, for during the intense period of construction, beginning in June, 1925, and reaching its height in February, 1926, our own organization necessarily was enlarged, and for some time as many as 15 contractors were on the job with us. This surplus, together with our own increase of 44,000 man-hours in 1925 compared to 1924, enlarged the number and variety of hazards considerably, but it can be said that six accidents causing 122 days lost time from January 1 to April 1, during this most hazardous period, was an improvement over 16 accidents and 245 days lost time for the corresponding first quarter of 1925. Furthermore, it was not without the fine spirit of cooperation shown by every one that this reduction was made.

This seemed a fair record for beginners, and probably education was the prime factor in producing the above result. However, it was felt that this record could be greatly improved by some better method of stimulating the men in favor of accident prevention. As a first step in this direction

"Doctor Jack" Mathews, plant nurse at the dispensary

the safety committee was increased in January, 1926, from one permanent committee of foremen only by an additional committee whose members were picked from each department. This Workers' Safety Committee rotates every three months, when one new man from each department is elected as a member in forming the new group to replace the men who have served the previous three months. When the latter members are retired it is made clear to them that they must continue to spread the safety first doctrine, even though they are no longer active members of the safety committee. Thus, eventually each man in the plant will have a chance to sit in on accident prevention discussions and will carry away with him the proper individual attitude which is needed to make progress in reducing accidents.

Making Safety Meetings Interesting

The important point in conducting safety meetings is to make them interesting as well as instructive, and with this in mind we have found it profitable to devote a part of each foremen's meeting to the reading of one booklet on "Foremanship" in the course published by the Elliot Service Co. These pamphlets never fail to bring out worthwhile comment. They not only serve to give each foreman a new slant on his problem of handling men, but lead to more effective results in getting men to think, act and talk on the subject of accident prevention through use of better methods where the human element is involved. In addition, seven bulletin boards, located throughout the plant, display posters which are renewed regularly every other day in order to keep up interest in them. These talks around the table are brought home to the men even more effectively through a small but valuable pamphlet, "The Safety Pin," published by H. S. Wittmaak, Erie, Pa., which is given to each man once a month with his pay check. I have never noticed one of these pamphlets discarded—a proof of their value.

It seemed that even with all this attempt at education there still remained one weak link in the chain which gave way at the critical time only to spoil promising records of time passed without an accident. This weak link was the new man. Even though foremen had been constantly cautioned about explaining hazards to the new man, this proved ineffective. Therefore, after some study of the situation an employment department has been established recently, with education of the men as one of its prime functions. Each newcomer is given a safety code which is shown below:

SAFETY CODE TO ALL EMPLOYES

GREETINGS: We want your stay with us to be long, prosperous and free from injury. **Work Safely, Prevent Accidents** to yourself and others, then we can all enjoy **Safety.**

1. When injured so that BLOOD FLOWS, go to the Company Hospital AT ONCE. If you delay, blood poison may result. Report any injury to the Company Hospital. All service is free to you.

2. You are especially cautioned to ROLL UP YOUR SLEEVES, REMOVE YOUR NECKTIE and NOT WEAR GLOVES while working on drill presses, lathes, saws, reamers or other revolving machinery.

3. STOP MACHINERY to clean or adjust moving parts by pressing the STOP BUTTON. Then get your Foreman to lock the safety switch while men are working on machinery.

4. UNDER NO CIRCUMSTANCES start machinery without REPLACING ALL GUARDS.

5. CALL AN ELECTRICIAN if electrical equipment is out of order. Do not repair it yourself.

6. GOGGLES MUST BE WORN while working at grinders, welding or burning, babbitting, chipping, breaking concrete or drilling stone. They can be had in the employment office and must be returned after you have used them.

7. "MUSHROOM" HEADS on hand tools are very dangerous. Have the blacksmith rehead your your tools before using them or before returning tools to storeroom.

8. UNDER NO CIRCUMSTANCES stand or walk under crane loads.

9. DO NOT REMOVE or REPLACE a BELT on a pulley while in motion. Use a belt pole to remove overhead belts on line shafting and do not wear loose or torn cloth-

ing while at work. It may catch on machinery and injure you seriously.

10. GET UNDER COVER QUICKLY when you hear the whistle warning of a blast in the quarries.

11. It is DANGEROUS to walk on railroad or hoistway tracks; and JUMPING THROUGH CARS IS POSITIVELY FORBIDDEN.

12. Falls, falling tools and other materials cause THREE-FOURTHS of all accidents. WATCH YOUR STEP, HANG ON TO YOUR TOOLS, WATCH THE OTHER FELLOW.

13. INSPECT CHAINS and CABLES before using. Don't use them if they appear unsafe. Take them to the blacksmith for repairs.

14. REPORT UNSAFE PLACES TO your foreman. PREVENT ACCIDENTS.

15. RUNNING, HORSEPLAY or SCUFFLING is an unsafe practice at the mill. Save this for other places.

16. Provide all scaffolds and dangerous excavations with RAILINGS and TOE BOARDS. Build scaffolds of sound material.

17. Wear a LIFE BELT while working over the crusher or on high places.

18. RUBBISH CANS are for your use; help keep the plant clean and safe from fires.

19. DON'T SMOKE in the PACK HOUSES, BAG HOUSES, STOREROOMS or COAL MILL. Don't throw away cigarets or cigars without putting them out.

20. INTOXICATION on the job is positively forbidden. Any man in this condition is an unsafe worker and will be discharged.

NAZARETH CEMENT CO.

KEEP THIS CARD.

MAKE IT YOUR BIBLE.

KEEP THE SAFETY FLAGS FLYING.

Each of these items is explained to the new man by the safety engineer, and the accident prevention program is made clear to him before taking the man to his place of work, where the hazards of his particular job are pointed out. Thus, the new man is taught from the beginning how to take care of himself and when to look out for others who may become careless.

Competition as a Factor in Accident Prevention

However, all this teaching and preaching becomes a humdrum affair without the spice of competition, just as most of us would have found school uninteresting without competition entering into the work in some form or other. Therefore, it has been our object to keep the men interested in the game of preventing accidents by dividing the plant into three competitive groups: the Quarry, Mill and Yard. On July 1, 1926, at the semi-annual meeting of all employees, three green and white safety flags were raised on separate flagstaffs representing these three divisions. The men were told that at the end of 30 days, if no accident had occurred, each group passing that period without a lost-time accident would receive a gold flag in place of the green, to be flown continuously for the duration of the period passed without an accident. In case of an accident the flag would come down and remain down until the end of that month in which the accident occurred. This created quite a stir and the result was that 68 days passed before the first flag had to be lowered, a fair length of time, although the previous record of 75 days had not been broken. At this writting no accident has occurred for 60 days, and we hope to beat all previous records this time, for, as the "big boss" says, "records are only made to be broken." Here it might be stated that it is not fair to employees to teach the false premise that *all* accidents can be prevented. If this impractical idea is allowed to spread, men will work under a subconscious fear of being blamed for every accident. This will only cause accidents. However, they must be taught that confidence in their own ability to work safely will cut down the number and severity of *preventable* accidents.

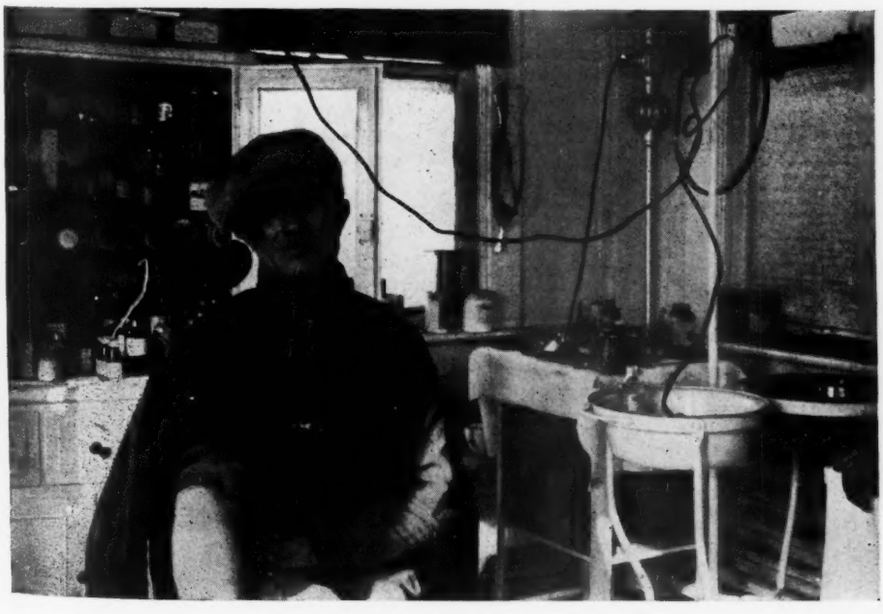
Something after the manner of one Canadian Cement company plant which won the safety trophy last year given by the Portland Cement Association, large white numbers have been hung near the time clock to indicate the number of days passed without an accident. It is the duty of a different man each day to hang up the new record; just another phase of creating interest.

Entrance to the dispensary at the Nazareth Cement Co. plant

Neither education nor competition can be carried out effectively without organization, which begins at only one correct place, the top, through the expressed backing of the management to prevent accidents. With its excellent cooperation the policies of the management are put to work by the safety engineer in conjunction with the two committees as outlined above. The foremen's committee, together with its accident prevention work, holds in its hands the protection of property as well as life; namely, fire prevention and protection. Each foreman heads a unit of the Mill Fire Department which is drilled regularly in methods of handling all fire apparatus.

Making the Dispensary an Important Unit

In connection with another branch of this work each foreman is taught to cooperate with the plant nurse in making the dispensary one of the most important units of the whole personnel organization by caring for sanitation of property and health of men. Certain employees in each department where



Interior of dispensary. The patient in the foreground has just been treated for an arm injury

dust conditions are injurious to sensitive human tissues, are sent to the dispensary each week by their foreman to receive an inspection and treatment of ears, nose and throat. It is felt that proper care of these organs will minimize the spread of colds and grippe, which so often cause a great deal of lost time. This also tends to make the service of the dispensary familiar to many men who perhaps through natural procrastination do not keep themselves in first class physical condition. Foremen have voluntarily commented upon the fact that their time books show more actual hours worked per man than ever before in their connection with the company. Perhaps the annual dispensary report given below will show more clearly just how important this unit has become, for this actual record from July 1, 1925, to July 1, 1926, shows a total of 2498 cases treated by Mr. Matthews, a figure of real importance. Furthermore, approximately 90% of these men were prevented from laying off due to sickness or minor injuries because they received adequate treatment in time to prevent their maladies from reaching a critical stage. There has never been a case of infection during the past year which prevented a man from doing his regular work.

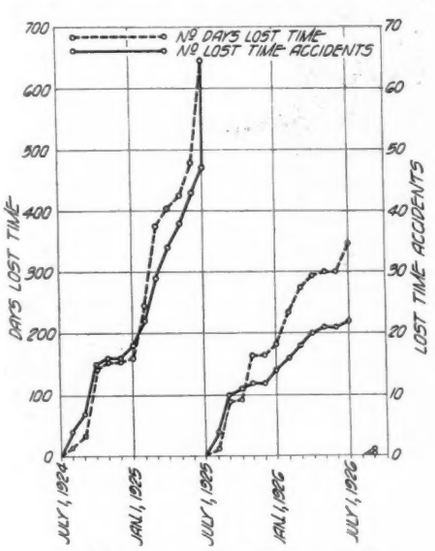
NAZARETH CEMENT CO. ANNUAL DISPENSARY REPORT

	Number of Cases	Number of Treatments	Number of Dressings
Abrasions of parts of body	275	.....	393
Abscess, different parts of body	24	.....	139
Ace bandages	.....	45	.....
Alcoholism	7	9	.....
Anti-tetanus serum — 1500 units	.....	5	.....
Asthma	8	21	.....
Bed sores	2	.....	19
Blisters	29	.....	31
Boils, neck, etc.	33	.....	121
Bunions	1	.....	1
Burns, arms, legs, etc.	102	.....	252
Canker sores of mouth	4	.....	3
Carbuncle	1	.....	5
Cauterized	.....	2	.....
Chapped hands	5	.....	5
Chlorine treatments	.....	13	.....
Cold in chest, head, etc.	168	201	.....
Concussions	1	1	.....
Conjunctivitis	43	163	.....
Constipation	74	81	.....
Contusions of parts of body	195	.....	414
Cramps	19	30	.....
Cut fingers, etc	216	.....	364
Cystitis	1	9	.....
Diarrhea	18	32	.....
Dislocation of shoulder	2	.....	.....
Dog bites	2	2	.....
Earache	2	2	.....
Ear douches	.....	79	.....
Ears, foreign bodies in	72	.....	.....
Epsom salt soaks	.....	45	.....
Eczema	6	13	7
Electric flashes	3	.....	.....
Electric massage	.....	115	.....
Electric pads	.....	2	.....
Erysipelas	1	1	.....
Examined men (2 rejected)	103	103	.....
Excessive perspiration of feet	1	2	.....
Eyes, foreign bodies in	147	.....	.....
Eye treatments	.....	348	.....
Eye washes	.....	32	.....
Foreign bodies in parts of body	80	17	.....
Fracture, finger, etc.	1	.....	1
Fracture, ribs	5	.....	.....
Frostbite of hands	1	1	.....
Furuncles, leg, etc.	54	.....	85
Gastritis	3	4	.....
Gonorrhea, rejected	1	.....	.....
Grippe, 4 home visits	43	52	.....
General debility	19	21	.....
Headache	83	86	.....
Heartburn	11	13	.....
Heat exhaustion	3	4	.....
Heat prostration	5	5	.....
Hot pads	.....	1	.....
Indigestion—acute, chronic	82	115	.....
Infected wounds	26	.....	209
Infected insect bites	2	.....	35
Ingrown toenail	3	.....	3
Irrigations	.....	10	.....
Ivy poison	23	.....	70
Lacerations of fingers, toes, etc.	102	.....	307
Liver congestion	16	19	.....
Lumbago	32	32	.....
Mouth washes	.....	14	.....
Mumps	1	1	.....
Nasal catarrh	22	.....	.....
Nasal douches	.....	144	.....
Nasal sprays	.....	170	.....
Neuralgia, facial, intercostal	9	10	.....
Neurasthesia	1	1	.....
Neuritis	2	2	.....
Nosebleed	2	4	.....
Nose, foreign bodies in	14	.....	.....
Opened, incisions	.....	195	.....
Otitis media	2	.....	.....
Pharyngitis	19	.....	.....
Piles	1	1	.....
Pyorrhea	1	.....	.....
Punctured wounds to parts of body	65	.....	160
Reduced	.....	3	.....
Removal of nails	.....	2	.....
Rheumatism	29	35	.....
Removals	.....	149	.....
Scabies, ordinary	2	.....	3
Scabies, itch	12	.....	22
Shock	1	1	.....
Soaks, hot	.....	132	.....
Sore throat	53	.....	.....
Sprains of wrists, ankles, etc.	50	.....	.....
Strain of back, etc.	14	.....	.....
Strapped	.....	149	.....
Throat gargle	.....	146	.....
Throat swabbed	.....	78	.....
Throat sprays	.....	4	.....
Tonsilitis	5	.....	.....
Miscellaneous	33	105	6
	2,498	3,082	.....

The dispensary serves another important function in connection with the recently organized employment system. In order to insure health and safety of employees, it was decided that the type of new man is most important to the present organization whose personnel seems to be above average. Therefore, before a new applicant is accepted be undergoes a thorough physical examination in order to make sure that he is fit to perform the work for which he has applied. But this is not all. The question is this: Has he been a safe and desirable worker at his last place of employment? His past record is looked into, and except in times of unfavorable labor conditions, when an emergency must be met, the applicant must come up to requirements before he is admitted to the organization.

Mutual Benefit Association

Health of men has an important bearing in another direction, namely, success of the Employees' Mutual Benefit Association, to which every man contributes a small premium each month. He receives in return a group life insurance policy paid for by the company, also sickness and accident benefits from the treasury of the Benefit Association.



Accident records, 1924 to 1926, inclusive

In developing a system of employment the aim has been to bring about the following results:

1. Maintain **the type of** personnel at a high level and reduce labor turnover through a close check on men entering and leaving the employ of the company.

2. Improve the accident record, and lower insurance rates by teaching new men from the beginning the hazards to be met with and avoided.

3. Improve the *esprit de corps* of the group and thus reduce labor costs by explaining the labor policies of the company to the new man. This helps to show him that he is expected to reciprocate the fairness of the management in dealing with its employees.

4. Place a man where he is best suited for work both physically and mentally.

5. Insure the position of the company and the mutual benefit association against physical defects which may disable an employee later on if a defective applicant is not refused work in the first place, or given a job in keeping with his physical ability.

6. Prevent the spread of contagious diseases.

7. Insure the company of a labor reserve through records kept of good prospects who cannot be used at the time they apply for a position.

8. Provide a place where men can offer suggestions which may prove valuable. Destructive criticism having no foundation can be readily checked.

9. Prevent undesirable employees who have been discharged from being reemployed in another department, unless they have been discharged for personal reasons. In this case a transfer to another department may prove desirable.

Recreation has not been forgotten as a function of this personnel organization. Early in the spring of this year the management provided a baseball diamond near at hand. Few evenings passed during the summer when it was not in use by one or two of the seven teams representing various departments of the plant. Two games a week were played by the teams in this league until weather conditions made it impossible to complete the schedule. From these seven teams a Nazareth Cement Co. team was chosen which played 13 games with other mill teams in the vicinity. Of the 13 games played the team won ten, losing three.

There has been time left for those possessing musical talent to find enjoyment in organizing a double quartet which has given its members, at least, a great deal of entertainment upon numerous occasions. This and other musical talent has not been in the background at the annual clam bake given for all employees.

Now comes the proposition: What are the results of this unit in relation to results in other branches of the company organization? What bearing has it upon the whole? Does it pay? Whether it pays in actual dollars and cents is a question for the management to decide. Although so striking a record as that of some other cement companies has not been attained, something has been accomplished, strides have been made in the prevention of accidents. The figures and curves shown indicate a reduction in accidents of 53% and of lost time 50% within a year.

ACCIDENT RECORDS, 1925 AND 1926

Year 1924-25

	July 1 to Dec. 31, 1924	January 1 June 30, 1925	Annual Total
Number lost time accidents	18	29	47
Days lost time	161	486	647

Year 1925-26

	July 1 to Dec. 31, 1925	January 1 June 30, 1926	Annual Total
Number lost time accidents	14	8	22
Days lost time	183	164	347
Reduction of accidents			53%
Reduction of lost time			50%

July 1 to October 1, 1926

Accidents	1
Days lost time	3

That the policies of the management are reflected in the attitude of the majority of employees towards their work and towards the company is apparent to those who come in contact with these problems every day. That teaching men to think and talk and act for prevention of accidents is not prohibitive in cost is apparent on the face of it. We find that in the aggregate it pays!

Concrete Materials by Weight

WRITING in the *Professional Engineer*, January, 1927, R. W. Crum and Mark Morris, of the Iowa State Highway Commission, describe the experience of the state with proportioning concrete materials by weight. The advantages of the method given by the authors are:

1. That a definite and constant relationship between quantities of materials used in a series of batches may be maintained.
2. That errors and variations due to the bulking effect of moisture, especially in volumetric measurement of fine aggregate, are at once greatly reduced and may be easily eliminated.
3. That the inspector has a practical and definite control of the measuring and mixing operation, and
4. That the contractor, as well as the state, has a reliable and authentic record of the quantities of each material used.

Various types of weighing apparatus are used, but they are divided into five classes:

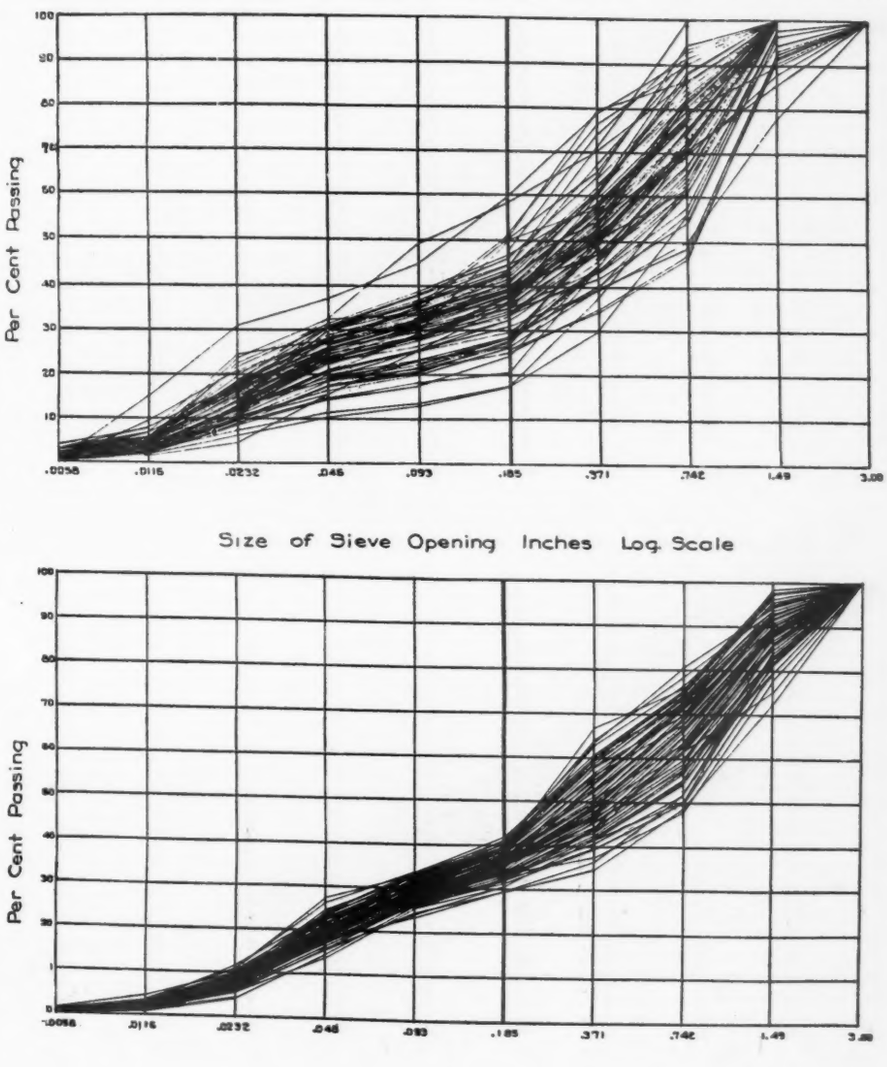
1. Bottom dumping hopper, mounted on lever weighing system with direct reading dial scale,
2. Batcher device with scale weighing system,
3. Bottom dumping hopper on platform scales,
4. Side dumping hopper on platform scales,
   a. Stationary for either truck or industrial railway loading plants.
   b. Movable for industrial railway loading plants.
5. Bottom dumping hopper with pipe lever weighing system.

All weighing apparatus is calibrated daily and the sensitiveness checked. The maximum error in proportioning by weighing is 0.5% and with volumetric measuring it has been found difficult to keep the error within 3.5%. Moisture determinations are regularly made and weights corrected for moisture content.

Two charts showing the grading of a number of batches are reproduced here because they show at once the advantage of weight over volume proportioning. Regarding these the article says:

Figure 1 is typical of the results obtained when the volumetric method of proportioning was used. Fine aggregate is defined as that portion of the aggregate which will pass through the square mesh sieve having clear opening of 0.185 in. Coarse aggregate is the material retained on this sieve. Had the proportioning been exact all curves shown in Figure 1 should have passed through a point representing 33% of the material as passing a sieve opening of 0.185 in. As actually proportioned variations from the expected result were from 16 to 27% with 10 to 12% as a common deviation.

Figure 2 is typical of a series of curves showing the results obtained by the weight method of proportioning. In this case all of the lines representing sieve analyses should pass through a point at which 34% of the material passes the sieve having an opening of 0.185 in. The results indicate that this method of proportioning has been successful to a marked degree in so nearly realizing the primary objective of its use. The range of variation from the desired proportion is much less than found for the volumetric method. The deviation in this typical curve is from 4 to 8% below and above the required figure. The curves prepared for many of the more recently completed projects show variations of 2 to 5%.



Comparative gradings of many batches of aggregate proportioned by volume are shown in the upper chart and the same proportioned by weight in the lower chart. Referred to in the text as Fig. 1 and Fig. 2

Effect of Shape of Mineral Aggregate on Stability of Asphalt Paving Mixtures*

A Study of Mineral Aggregates from Which a New Theory of Stability Has Been Evolved

By Victor Nicholson
Engineering Chemist, Department of Public Works, Chicago, Ill.

IN order to improve the technique of the asphalt mixes when using sand which varied widely at different times and to test out new sources of supply, the city of Chicago was prevailed upon to obtain the necessary apparatus to run stability tests soon after Hubbard published his first paper on the subject. The problem is to so modify our mix containing sand or other aggregate that we can keep our three asphalt plants going continuously without interruption. It is in connection with this problem that the present study was made and when report is made on this the matter herein will be included

In the opinion of the writer the question of sharpness of mineral aggregate has always been shrouded in mystery, sharpness being condemned by some, favored by others and not mentioned at all by most writers. This is a most natural attitude to take, for no facilities have been available to study this effect until the various forms of apparatus had been designed for testing stability. Even though sharpness has for the most part been ignored, the writer has been led to believe that it has an important bearing on stability by the action of some rock asphalt pavements that have been laid by the bureau of streets in our city. Some of these have been down nearly three years, and after a close examination none have showed any signs of instability. This material being a cold laid one, contains a soft asphalt and mineral matter which has a grading not similar to any of our standard sheet asphalt mixes but with a shape of particle that is different from the lake sand ordinarily used. Bearing this in mind the writer decided to give this detail of asphalt pavement mixtures more careful study than has heretofore been given to it.

*Paper read before the Fifth Annual Asphalt Paving Conference, Washington, D. C., November 8-12, 1926.

VICTOR NICHOLSON, the author of the paper abstracted here, has worked out a new theory for the stability of asphalt mixtures. It is that: "Stability is entirely dependent on the proportion of the area of the surfaces of the grains of the aggregate used that is in contact under pressure." He has checked this theory by many tests, a part of the work being summarized in the paper given here. Mr. Nicholson is still working on the theory, applying it practically by mixing aggregates to obtain the greatest stability from available materials. His later work is to be incorporated in a paper which will be published in a succeeding issue of Rock Products. The matter is of importance to producers as it promises to find new uses for crushed granite and trap rock screenings as well as those of the harder sorts of limestone and perhaps crushed gravel and the finest sizes of crushed slag. Mr. Nicholson's present work is studying the improvement of stabilization in mixing some of these with sand of a low stability factor and his results are more than encouraging.—The Editors.

In order to make results applicable to our needs this study is restricted to types of material that could be obtained in Chicago without too much difficulty. Samples studied are as follows:

A friable sandstone from Ottawa, Ill.

Lake sand as delivered to city asphalt plants by Material Service Co., Chicago.

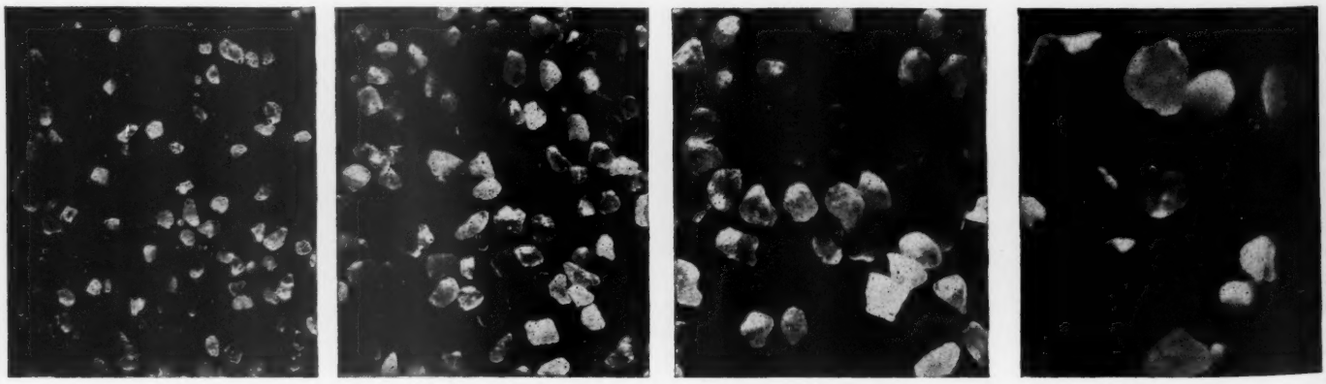
Mineral matter obtained by extracting bitumen from rock asphalt as furnished by the Kentucky Rock Asphalt Co.

Crushed quartz passing 10-mesh screen from Wausau Abrasives Co. quarry at Wausau, Wis.

Crushed granite or screenings finer than ¼-in. from Waushara Granite Co. at Lohrville, Wis.

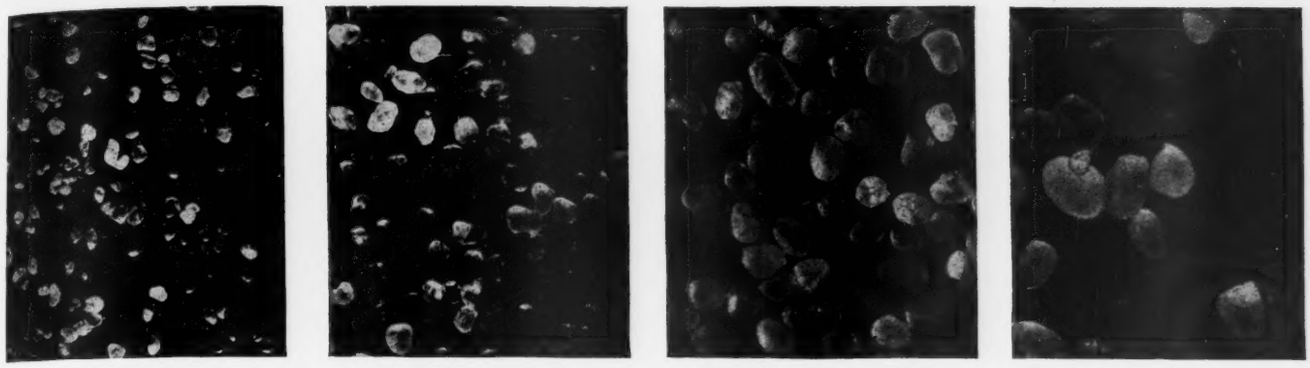
The method used in making the tests was the same as Hubbard's modified method as given before the A. S. T. M. in 1926 except that the 20,000-lb. Olson machine used was fitted with a dial of the writer's design reading to 5000 lb. in increments of 25 lb. In extending the briquet the load was applied at the rate of one revolution per second or 1/192-in. at the head. This made the readings on the indicator easier to take.

Instead of heating the samples directly on machine at 60 deg. C. according to Hubbard's methods, these tests were run by heating the briquets in a Cenco constant temperature apparatus at the same temperature, for the prescribed 60 minutes, then transferring to the extrusion mold which, together with the plunger, has been brought to a temperature of 60 deg. C. in water placed in a 50-lb.



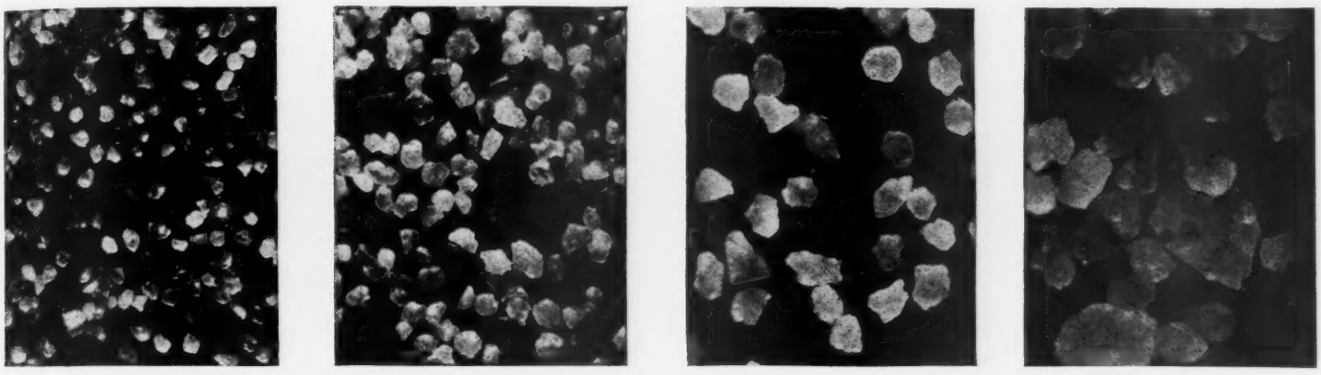
80 mesh and finer | *Through 60, retained on 80 mesh* | *Through 40, retained on 60 mesh* | *Through 20, retained on 40 mesh*

Series 1. Photo-micrographs of various sizes of lake sand



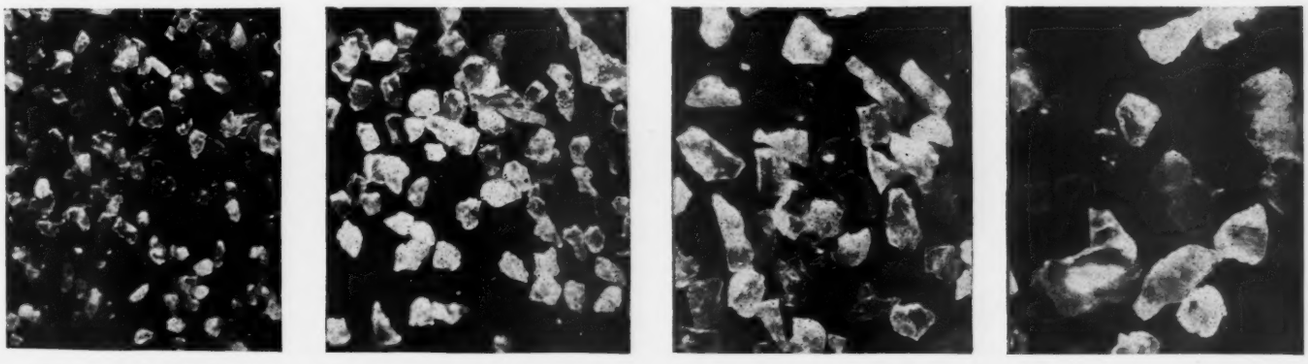
80 mesh and finer | *Through 60, retained on 80 mesh* | *Through 40, retained on 60 mesh* | *Through 20, retained on 40 mesh*

Series 2. Photo-micrographs of various sizes of Ottawa sand



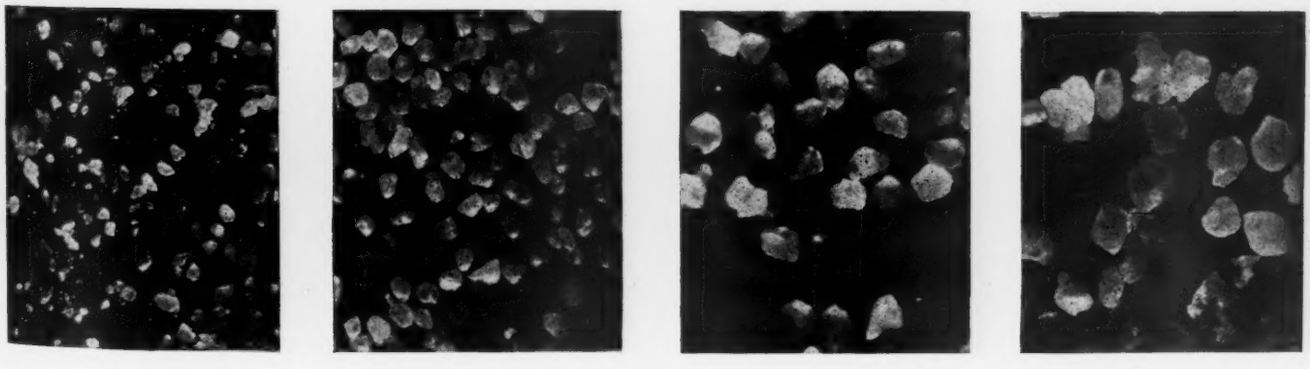
80 mesh and finer | *Through 60, retained on 80 mesh* | *Through 40, retained on 60 mesh* | *Through 20, retained on 40 mesh*

Series 3. Photo-micrographs of various sizes of crushed granite



80 mesh and finer | *Through 60, retained on 80 mesh* | *Through 40, retained on 60 mesh* | *Through 20, retained on 40 mesh*

Series 4. Photo-micrographs of various sizes of crushed quartz



80 mesh and finer | *Through 60, retained on 80 mesh* | *Through 40, retained on 60 mesh* | *Through 20, retained on 40 mesh*

Series 5. Photo-micrographs of various sizes of Kentucky rock asphalt after extraction of bitumen

white lead pail and then placing pail with its contents under the head of the compression machine and applying the load as stated before.

These are the only variations in method from that given by Hubbard and yield satisfactory results. All tests were made in triplicate, individual tests not varying over 5% from average, and this average recorded as stability of mix.

The asphalt used throughout these tests was an oil asphalt that had the following characteristics.

Penetration at 77 F.	42.
Penetration at 115 F.	160.
Penetration at 32 F.	15.
Penetration after 5 hrs. 325 F.	36.
Loss on heating 5 hrs. 325 F.	.05%
Specific gravity at 60 F.	1.04
Ductility at 77 F.	115 Ctm.
Solubility in CCl_4	99.68

The filler used was a ground limestone dust furnished under our specifications. It met the following requirements:

Passing 200 mesh	82%
Passing 100 mesh	96%

All aggregate was put through a 20-mesh sieve to make results comparative. It happens that the Ottawa sandstone grain practically all passes a 20-mesh, and the same condition exists with the mineral matter of Kentucky rock asphalt. Crushed granite contained considerable amounts of 200-mesh material, so for two series this 200-mesh was sieved out.

In order to make the sand used compare with that obtained on contract last year the lake sand was sieved into its various sizes and then re-combined to give the grading given below:

GRADING OF SANDS

	200 mesh	80 on 200 mesh	40 on 80 mesh	20 on 40 mesh
Lake sand	0	35	55	10
Ottawa sand	0	5	55	40
Crushed granite	0	31	32	37
Crushed quartz	2%	15	37	48
Rock asphalt (Mineral matter).	4%	15	66	15

Examining these grains under the microscope we find that lake sand is sharp in sizes smaller than 60-mesh but as the sizes get larger the sand becomes more round. Ottawa sand is almost completely round in all sizes. Quartz and granite are sharp and angular in all sizes. Kentucky rock aggregate is sharp and angular in practically all sizes down to 40-mesh when it seems to show some evidence of water wear.

In order to show the relative stability of the aggregates two sets of briquets were made up using the aggregate as given under grading of sands. One using 8% of the asphalt with 92% of the aggregate shows results as given below in Table I.

TABLE I

	Lake Sand	Cr. Quartz	Cr. Granite	Rock Asphalt
Voids in aggregate	34.7%	37.4%	38.1%	34.7%
Asphalt to fill	18.0%	19.9%	19.7%	17.9%
H't of briquet, in.	1 1/64	1 1/64	.....	1
Sp. gr. of briquet	1.925	1.920	.....	1.920
Pounds stability	408	1512	1917	1750

On examining these figures it is shown that even though lake sand contains the least amount of voids the stability is by far the lowest. The results obtained from granite were rather surprising and the only explanation for it is the relatively rough and sharp surfaced grain. The result given under rock asphalt explains in a large measure the reason for the stability of this type of pavement.

Another set of briquets was made up using 8½% of the asphalt with an aggregate of 91½% composed of the material given in table, to which enough stone dust had been added to make 20% passing 200-mesh in the finished mix. Results obtained are given herewith:

TABLE II

	Lake Sand	Cr. Quartz	Cr. Granite	Rock Asphalt
Voids in aggregate	27.2%	28.6%	27.2%	.....
Asphalt to fill	12.6%	13.6%	13.3%	.....
H't of briquet, in.	7/8	57/64	59/64	7/8
Sp. gr. of briquet	2.28	2.20	2.16	2.22
Pounds stability	2150	2808	3383	4000

These results show the stabilizing influence of limestone dust, but at the same time show the effect of using a rounded mineral aggregate. As before stated, under Table I, lake sand even though it produces the densest mix, does not necessarily produce the most stable mix. The extremely high stability given with rock asphalt is surprising and should be the basis for further study. The low specific gravity on the crushed granite is something that has not been explained.

Two sets of briquets were made up using the aggregate as before, but sieved and regraded to conform to the standard grading of the lake sand. One series was made up comparing these aggregates by weighing out 8% of the asphalt with 92% of the mineral matter. Results from this test are shown in Table III.

TABLE III

	Lake Sand	Ottawa Sand	Cr. Quartz	Cr. Granite
Voids in aggregate	34.7%	.....	39.4%	34.7%
Asphalt to fill	18.0%	.....	20.8%	18.0%
H't of briquet, in.	1 1/64	1	1 1/16	1 1/16
Sp. gr. of briquet	1.92	1.93	1.85	1.87
Pounds stability	408	175	1275	1708

This table includes the Ottawa sand, which could not be included in the other tests on account of lack of material. For the same reason rock asphalt had to be eliminated from this study. The striking feature of this test seems to be the denseness of the Ottawa and lake sand briquets and the extremely low stability of same. The comparatively high specific gravity of Ottawa seems to indicate that a well rounded sand packs better than a sharp one.

The other set of briquets was made up using 8½% of the asphalt with an aggregate composed of the standard graded mineral matter as given under Table III, together with enough limestone dust added to same to make 20% of 200-mesh material in the finished mix. Results of this test are given in Table IV.

TABLE IV

Aggregate Graded to Standard Mix and 200-Mesh Material Added to Make 20% in the Finished Mix

	Lake Sand	Cr. Quartz	Cr. Granite	Ottawa Sand
Voids in aggregate	27.2%	31.3%	30.6%	.....
Asphalt to fill	12.6%	15.5%	14.7%	.....
H't of briquet, in.	7/8	15/16	29/32	7/8
Sp. gr. of briquet	2.28	2.14	2.16	2.27
Pounds stability	2150	2558	3475	2500

These tests show against the stabilizing influence of the stone dust and that a sand with no inherent stability, as, for example, a sand like that obtained from Ottawa sandstone can by such treatment be made suitable for pavement purposes. As before, crushed granite gives the highest stability, even though the specific gravity of the briquet is among the lowest.

In order to show the relative stabilities of a given mesh of any of the aggregates, briquets were made up of material obtained by screening through a 20-mesh and retaining on a 30-mesh. Results are given in Table V.

TABLE V

Aggregates Sieved to Pass 20-Mesh and Be Retained on 30-Mesh

	Lake Sand	Ottawa Sand	Cr. Quartz	Cr. Granite
H't of briquet, in.	1 1/32	1 1/16	1 1/32	1 1/32
Sp. gr. of briquet	1.87	1.87	1.89	1.90
Pounds stability	850	100	1525	1725

These results show that standard Ottawa sand, as compared to the others, has a practically negligible stability. The higher stability on lake sand when compared to those in Table I seems to indicate that a well graded sand is not always the most stable. As before, granite gives the highest results.

Summing up it can be said that sharpness of grain has a marked influence on the stability of the asphalt mix.

This influence persists even after the addition of limestone dust.

A sand lacking in stability can be greatly improved by the addition of 200-mesh material.

Relative stability is not dependent upon the density of the asphalt mix.

Concrete Road Design

WRITING in the current *Crushed Stone Journal*, A. T. Goldbeck, director of the bureau of engineering of the National Crushed Stone Association, gives some valuable information on concrete road design. It is important that aggregate producers should understand such matters, as it has happened that the aggregate furnished has been blamed for a poor concrete road, whereas the blame really lay with the design or that the road was opened too soon.

The article gives the theory of design commonly used and the formulas from which the slab thickness is calculated. It also discusses transverse cracking, explaining how this form is a result of the shrinkage of the slab and the resistance to shrinkage offered by friction on the sub-grade. Then it discusses the important matter of determining how soon the road should be opened to traffic. The rule given is that the road should not be opened until the concrete has attained such a strength that the modulus of rupture is at least twice the stress set up by the heaviest vehicle that would pass over the road. Mr. Goldbeck does not feel that the determination of this point may be safely calculated or left to an empirical rule. He thinks that it should be determined by the breaking of beams cast at the time the road was made and that an allowance should be made for the wilting of the concrete and some other factors.

American Concrete Institute Papers Discuss Aggregates and Cement

Committee Proposes Gravel Specification—Investigations on Concrete Materials Suggested

THE annual convention of the American Concrete Institute was held in Chicago, February 22-24. Much of the program was given to subjects which interest the producers of cement and aggregate only indirectly, such as concrete design. But some of the papers and discussions very directly affect producers, and one, which is of the greatest importance to the aggregate industry, is the report of Committee E-5 on the Requirements of Gravel as Aggregate.

Requirements for Gravel as Aggregate

THE report of the aggregate committee was confined to gravel requirements and was prepared by the sub-committee of which **Stanton Walker** is chairman. The report began by showing that present specifications are indefinite and of the rule-of-thumb order. It stressed the need for further information on the characteristics of gravel, of which it said:

Lack of information concerning the effect of many of these characteristics has made it impossible to place proper limitations on all of the different factors involved. Grading is the only factor of which it may be said that anything approximating adequate information has been obtained; only the most limited data are available on what constitutes proper limitations for characteristics, such as hardness, strength, durability, etc. The principal part of this report is devoted to discussions of the physical characteristics of the aggregate particles.

Hardness and Strength of Gravel

This part of the report contains a resumé of the various methods for testing the hardness of gravel that have been devised, most of which are modifications of the ordinary Deval abrasion test.

The method of M. A. Rea, which tests the gravel in a Deval machine with shot included as an abrasive, has not, so far as the committee has been able to learn, been able to establish a definite relationship between the concrete making properties of gravel and the hardness as measured by this method.

The impact test proposed by F. H. Jackson (in which a steel ball is dropped from a definite height on individual pebbles) is acknowledged by Mr. Jackson to be too severe, and he plans to make changes in the details of the test.

The pressure test with the Douglas machine, used by the Iowa State Highway Commission, determines the proportion of "rotten stone" in a sample. The sample is first classified by eye into hard, soft and partially disintegrated pebbles. In case of doubt the pebble is tested by pressure in the machine. R. W. Crum of the Iowa commission, who is chairman of Committee E-5, states that this method has been satisfactory in practice.

Professor Abrams' crushing test applies a load to a confined sample of gravel and determines the strength by making screen analyses before and after the test. Studies have not shown any relationship between this test and the concrete making properties of the gravel.

A study of tests made by the Lewis Institute and of the results of Jackson and Paul's paper on the accelerated wear test is given in appendices to the report. In none of the studies made can any definite relationship between hardness and concrete making properties be observed. The committee therefore concludes:

It does not seem unreasonable to suppose that, *except for soft, friable, and partially disintegrated particles and particles which are not durable on exposure to the weather,* any material which has withstood the action of the elements necessary for the formation of gravel consists of particles hard enough for the usual service in concrete. We feel, however, that more complete study of existing information and further comprehensive investigations are needed, definitely directed toward a solution of this problem.

The committee does not feel that it is in a position to offer recommendations for specifying hardness and strength of gravel as an improvement over present specifications.

Durability of Gravel—Effect of Shale

The words in italics in the quotation from the report given above should be especially noted, as the committee finds very serious affects from the inclusion of such soft material as shale and other non-durable particles. Their finding is in part based on the work of F. C. Lang, of the Minnesota State Highway Department, which is given in an appendix to the report. Mr. Lang found that even small percentages of shale affected the strength of concrete. In concrete highway paving it is particularly bad, according to the report, which says:

Mr. Lang points out that quantities of shale less than will produce a harmful effect on the compressive strength should not be permitted in gravel, particularly for wearing surfaces, as he feels that the shale will invariably be worked to the surface and form spots which will disintegrate at an early period under the influence of weather and traffic. He points out that their experience has caused them to limit the amount of shale permissible in gravel to 0.5% by weight.

Kansas, Iowa and Minnesota all have this shale limitation of 0.5%; Kentucky places a limitation of 1% on "shale, slate, etc.," and Michigan 3% on shale and other non-durable particles.

The committee further considers the float test or specific gravity test in which particles having a low specific gravity are floated to the top of a heavy solution of zinc chloride or lead acetate. (See U. S. Department of Agriculture, Bulletin No. 1216.) It also favors the sodium sulphate test and says that further studies of this test will undoubtedly develop a method for judging the resistance of gravel particles to the action of the weather. Of these tests it says:

"This sub-committee believes that any soundness test for gravel should be used to determine the percentage of unsound particles, and that limitations should be stated on this basis rather than to specify that no particles shall exhibit evidence of unsoundness.

"Soft, friable and laminated particles would undoubtedly, in many cases be attacked by a soundness test. As an additional precaution, it is suggested that an impact test along the lines described by Jackson, or a pressure test similar to that used by the Iowa State Highway Commission can be adapted to the limitation of such particles.

* * * * *

"This sub-committee suggests that recommendations for durability of gravel should be for the purpose of eliminating particles of low specific gravity which will have a tendency to be floated to the surface and particles which will disintegrate in the weather.

"Judgment of the durability of a gravel might, therefore, be based on:

"(1) The percentage of particles which will not withstand the action of the weather, as measured by a suitable accelerated freezing and thrawing test.

"(2) The percentage of soft, friable and laminated particles which would not withstand a suitable impact test or pressure test.

"(3) The percentage of light-weight particles which would be floated by a liquid of suitable specific gravity—gravity about 2.0.

"It is recognized that there probably would be much overlapping of these three tests; that is, particles eliminated by one of them would also be eliminated by one or both of the others. It is hoped that further work of this sub-committee will result in the development of a suitable procedure for these tests."

Cleanliness and Grading of Gravel

Cleanliness, including freedom from clay, organic matter and such material as coal lignite, mica pyrite oil, etc., is somewhat briefly considered by the report. Specifications concerning those are generally applied to sand rather than to gravel. The committee points out that if 3% of clay is objectionable in sand (as most highway departments claim it to be) a much smaller percentage would be objectionable in gravel.

As to organic matter, the committee recommends that the Abrams-Harder colorimetric test be carried out on that portion of the gravel that passes a No. 4 screen and then calculated to the total aggregate.

Of grading perhaps more is known than of other characteristics. Regarding grading the committee says that:

Too much emphasis has perhaps been placed on the specifications of a definite grading and on the use of the coarser-sized particles without giving proper consideration to the most economical grading.

This sub-committee feels that it is not within its province to specify sizes of gravel for different uses, but that these should be determined by local conditions. Specifications for grading should also be predicated on a study of the material in different localities. We recommend a form of specification as tending to promote uniformity of grading.

The committee makes some important recommendations for further study in which it wisely points out the necessity of taking local conditions in mind. For example, a test which requires the use of 1½-in. to 2-in. particles would not be applicable in localities where the largest particles of gravel available may be less than 1½-in. Especial study is recommended to correlate tests on hardness with concrete making quality. New studies are needed on the soundness and specific gravity test. From present information available, the committee makes the following recommendation:

Specification for Gravel

This sub-committee recommends that a specification for gravel take into consideration the following factors:

1. *Hardness and Strength.* Probably some modification of the Deval abrasion test or of the crushing test can be adapted to the speification of these properties. Further studies are required before definite limitations can be stated.

2. *Durability.* Particles which are not durable on exposure to the weather and soft, friable, laminated and light-weight particles should be limited, since they contribute to the lack of durability of gravel. Consideration should be given to the development of test methods along these lines:

(a) An accelerated freezing and thawing test, for the limitation of particles not resistant to the weather.

(b) An impact test such as that proposed by Jackson, or a pressure test such as used by the Iowa State Highway Commission, for the limitation of soft and friable particles.

(c) A separation on the basis of specific gravity, for the limitation of light-weight particles.

3. *Cleanness.* In considering the cleanness of gravel, cognizance should be taken of clay and silt, coated particles, organic impurities and other deleterious materials. Clay and silt, and probably loose coatings on gravel, should be limited by a decantation test made on material screened from the gravel through a No. 4 sieve. Organic impurities should be limited by an adaptation of the colorimetric test. Other deleterious materials would be limited to some extent by the decantation test, but further studies should be made to identify such materials and to develop methods for their determination.

4. *Grading.* The grading of gravel which is most economical depends on local conditions, and this should be recognized in preparing specifications. Any specification for grading should promote the use of a uniform product. The following general requirements are considered desirable:

Passing (maximum size) inch sieve	95 to 100%	Spread not more than 25%
Passing (½ maximum size) inch sieve	— to —	
Passing No. 4 sieve	0 to 10%	

Such a specification requires, of course, that separate consideration be given to the proportions for each different grading.

Studies of Aggregate

Qualifications of Different Kinds of Natural Stone as Concrete Aggregate

A PAPER well illustrated by charts and lantern slides given by Dr. G. F. Loughlin, geologist of the U. S. Geological Survey, gave the members some knowledge of the mineral constituents of the rocks used in both crushed stone and gravel as concrete aggregate. It is on these mineral constituents that the resistance to weathering and chemical action depends, so the subject is one that ought to be given much more study than it has hitherto received.

Dr. Loughlin began at the beginning with a talk on the primary rock minerals, the essentials, quartz, feldspar and orthoclase, and plagioclase, pyroxene, hornblende, olivene and the micas, with the feldspathoids and the main accessory minerals. He showed how these were altered to certain deep-seated minerals and at the surface to end products; clay minerals, iron oxides and alkaline sulphates and carbonates. Then he went on to give some idea of the common igneous rocks and the durability of the minerals composing them. Quartz and feldspar are very durable, olivene is all right if fresh but it is apt to be found in an altered condition. Muscovite (white mica) is very durable mechanically, but being laminated it absorbs water and swells. It does no harm if in small isolated crystals and not in a weathered condition. Black mica acts about the same.

Pyrite in well developed crystals is usually durable, but if altered it weathers and generates sulphuric acid. Marcasite is much less stable and will go to pieces sometimes in 24 hours. Zeolites, the alteration products of nephelite and anorthite, are bad, as they may fall to a white powder on weathering.

There are only two insoluble end minerals, clay and iron oxide. Iron oxide is very permanent and some of the clays are surprisingly permanent. He mentioned the kaolinite found in the Virginia sandstone from which old public buildings in Washington were built as an example. But other clay minerals went to pieces rapidly by absorbing water and swelling. To illustrate this he soaked six samples of clay minerals in glasses of water, some of which swelled and disintegrated, while others were water resistant.

Of the sedimentary rocks, Dr. Loughlin said that while most of the limestones had excellent resistance, it was possible to find good and bad limestones in the same formation. He showed slides from two Indiana quarries, one of the well-known Bedford stone, the other from a quarry in the same geological formation that had to be abandoned because the stone was not weather resisting. He pointed out that the product of each quarry had to stand on its own feet and that it must not be judged by the locality from which it came or its seeming similarity to some other stone.

Of gravel, he said that gravel was just as good as the pebbles which composed it were good. This applies equally to the granite gravels of New England and the limestone gravels of the middle west. For this reason it is not unusual to find good and bad gravels in the same area. In some of the glacial gravels the gravel at first deposited by the ice had time to disintegrate after the ice receded, and before the ice returned with a fresh supply, so that good and bad gravels might be found in the same deposit.

It is impossible to touch on more than a few of the high spots in Dr. Loughlin's paper and much of what he said would not be understandable without the micro-photographs. But enough was gathered from his talk to leave in the mind that there is a need for intensive study of the rocks used

as aggregate from the mineralogical side.

Coarse Aggregate as a Field for Needed Research

The paper by **Herbert J. Gilkey,** professor of civil engineering in the University of Colorado, discussed the question: Does the coarse aggregate used affect the strength of the concrete? Putting it in another way, it has been generally held that the strength of the mortar is the strength of the concrete, but Prof. Gilkey's tests tend to show that this is not true. He found that with the coarse aggregates used in his test the mortar strength was 10% to 20% greater than the concrete strength. Some reasons which might bring about this result were:

Lack of homogeneity caused by the introduction of the coarse aggregate.

Failure in bond between the mortar and the coarse aggregate.

Weakness in the aggregate itself.

Chemical effect of the aggregate on the mortar strength.

The speaker believes that the reason why the effect of coarse aggregate has not been noted before is that the usual lack of uniformity in strengths in test cylinders has marked the effect. But with refinements in testing it is now time to investigate the whole matter thoroughly.

The greater part of the paper was given to the presentation of the evidence secured by the speaker's own tests. From the evidence it appears that certain characteristics of the coarse aggregate used did change the concrete strength while the mortar strength remained constant.

Professor Gilkey suggests a thorough observation of types of coarse aggregate, taking into account the effect of quantity, size, shape of particle, nature of surface, including texture, treatment and cleanliness, strength of particle, durability, expansibility, specific gravity as compared with the mortar, stiffness as compared with the mortar matrix and arrangement within the concrete.

Under "quantity" he points that it seems reasonable that strength should fall off as the quantity of aggregate increases (as was the case in some of his tests).

Under "size" he notes that a large rock has relatively less surface to be gripped than a small rock, and he suggests a probability that initial compression failure within the mass is really a failure in bond between mortar and aggregate. As evidence he says:

The fact that gravel concretes of good sound washed particles often seem to be somewhat weaker than similar concretes from crushed stone is, if true, further evidence of possible weakness in bond. The crushed stone is interlocked and dovetailed into the mixture in a far more thorough manner than are the gravel particles. This suggests the next factor.

Under "shape of particle" he mentions some work already done as follows:

There is no question but that thin or enlongated particles of materials, otherwise suitable, are of a source of weakness in concrete. The particles are well embedded doubtless but bear alternately against the soft mortar bedment and the harder aggregate particles. They are thus loaded like beams within the mass and earlier breakdown will occur because of flexural failure of aggregates within the concrete mass. The genuineness of this condition was illustrated a few years ago. Two aggregates were made by breaking up ¼-in. and ⅛-in. scraps of plate glass until they would pass the 1¼-in. sieve. The concretes from these aggregates failed at lower load than concretes of more compactly shaped aggregates. The thinner plate glass carried much less load than the ¼-in. The most interesting feature, however, was the distinct groaning or grinding sound from within the mass that could be heard for some time prior to reaching the ultimate compressive load. There was little question but that the sound was merely the grinding together of fractured ends that resulted from the beam action of cross-bearing fragments.

As to "nature of the surface," Professor Gilkey would have a study made with rough, smooth and polished surfaces, also those coated with parafine, etc. In other words, he would study the effect of the bond between the mortar and the coarse aggregate on the strength of the concrete.

The "strength of particle" should be studied by comparing concretes made with weak and strong aggregates. Of the other factors mentioned perhaps the arrangement of particles in the concrete suggests the most fruitful field for study. A comparison of concretes made with orderly and disorderly arrangements of particles should add something to our knowledge of the subject.

Current Researches

Current research work on concrete and concrete materials was itemized in the report of Committee E-3 on Research, of which **H. F. Gonnerman** is chairman.

So far as the researches on aggregate go, practically the same material is to be found in the article "Highway Departments Test Road Materials," published in the issue of September 4, 1926.

Research in Cement

Portland Cement in Concrete Engineering

Under the title, Portland Cement in Concrete Engineering, Dr. R. H. Bogue gave the progress of the research work now being conducted by him and his assistants at the U. S. Bureau of Standards. No final results have yet been attained, but much that is both interesting and valuable to the concrete industry has already been brought out.

Dr. Bogue began by reminding his hearers that cement was only *one* of the materials that went into concrete and that it was probably the most uniform and consistent of them all. He mentioned the differences in aggregates used, the various admixtures such as hydrated lime and celite that were added in varying proportions and the salts in the mixing water, which were usually present in more than negligible quantities.

Concrete research so far has been along engineering lines, much of which goes back a long way. Vicat, for example, understood the effect of too much water with cement and condemned the combination of "dry brick and drowned mortar." As the result of such study the user of concrete can build with greater assurance, since the laws for the design of concrete mixes have been worked out.

Now researches on the constitution of clinker and the making of cement hold possibilities for control and strength. In fact, they hold promise for improvement in many directions both in the manufacture and use of cement. The work of Rankin and Bates was a good start in this direction.

Cement contains a number of compounds, each of which reacts with water. One set may react as hydrated lime reacts, while others are subjected to hydrolysis. But these compounds may change in the presence of air and water. All this must be studied in order to understand the processes of setting and hydration.

In order to study the compounds of which cement is composed the compounds must first be obtained in a pure state. The staff at the Bureau of Standards has been engaged on this work for two and one-half years. No problem has been completely solved, but eight papers have been published, although it is recognized that the work has only started.

Of fundamental importance is the nature of clinker, something which hitherto has only been guessed at. Recent co-operative study on this with an European authority has resulted in a report that is now in the press.

Other matters being studied are the effects of such substances as iron-oxide, alumina and magnesia, all of which are present in greater or less quantity in commercial portland cement. We need to know the binding value of these. To make the required cement for this study an electric furnace was devised which would hold temperatures up to 1650 deg. C. without varying more than 1 deg. plus or minus. Unfortunately the sample from this furnace was only a fraction of a gram, so a larger furnace of the same sort was built, capable of temperatures up to 1550 deg. C., which would turn out 2 lb. per day, a really large production under closely defined laboratory conditions. From the compounds made in this furnace 1-in. cubes could be formed and tested physically as well as chemically.

In this testing work the polarizing microscope had proven itself invaluable. Chemical analysis is not enough. The use of the polarizing microscope enables the compound being studied to be identified. In the cases where the microscope fails the X-ray diffraction method is resorted to. This is a new tool in the hands of the research man and has extended the possibilities of his work.

The biggest mistake that could be made would be to rush through a program of re-

search. It is certain that in the end this research work will tell us how to make and use a more nearly perfect cement.

Time as a Factor in the Study and Use of Cement

Two of the sessions of the Institute were devoted to studies of the use of time as a factor in concrete. One of the papers presented at the first of these was on Time as a Factor in the Study and Use of Cement, by **P. H. Bates** of the Bureau of Standards.

Mr. Bates said that cement was a substance actually useless in itself. Its useful qualities had to be developed by water—and time. The materials of which it were composed were all slightly water soluble; the changes induced by the addition of water might be modified by heat and the fineness to which subdivision (grinding) was carried.

Cement is a very heterogenous mixture of various compounds of lime, silica and alumina. On account of its heterogeneity it is very difficult to study, but it is possible to prepare some of the compounds composing it in a pure state and to study them.

It is unfortunate that we have educated ourselves to value cement only by its strength, as there are various other characteristics which are quite as important.

He showed a slide on which were given tables of cements formed of pure compounds and showed the relation of time of setting and hardness to the composition. These were laboratory tests, but on a second slide he showed a series made in a commercial plant. These had lime contents (CaO) from 61% to 67% and silica contents from 21% to 27%. The high lime cement was the quickest to harden, but the high silica cement, while it hardened slowly, showed a regular increase in strength through a long period of time.

Another slide showed how CaO and Al_2O_3 go into solution after the water is added to cement and afterward go out, which would indicate the formation of new compounds. This test was made on high-alumina cement, but something of the same kind goes on with portland cement.

He called attention to the fact that the water ratio must be carefully maintained with high-alumina cement and said that it might be necessary to develop a special technique for the use of this cement.

A point brought out was the possibility of placing cement with excess water and then removing the excess, leaving only sufficient water for hydration. It is probable that in the case of "sloppy" cements placed in leaky forms this has often been done unintentionally, which would account for the satisfactory concrete strengths obtained under such conditions. It might be shown that if the excess water was removed inside of four hours there would be no danger of removing any amount of solubles in sufficient quantity to impair the final strength of the cement.

Water-Cement Ratio as a Basis of Concrete Quality

The paper on the water cement ratio as a basis of concrete quality, by **Duff A. Abrams,** was read for him, as Professor Abrams was not able to be present.

It explained the familiar strength formulas for portland cement concrete, but it brought out some additional facts which showed that more than the mere strength of the concrete was dependent on the water-cement ratio. One fact was that the resistance of concrete to alkali waters was proportional to the 28-day strength, which, of course, is determined by the water-cement ratio. The maximum water tightness is another important characteristic in some cases, and to secure it the water cement ratio must be maintained within a very narrow range.

Reference was made to the specifying of concrete by the water-cement ratio alone, as was done in the case of the building of the Portland Cement Association building, as described in McMillan and Walker's paper.

The possibilities of getting early high strength by control of the water-cement ratio are now well established. Early high strength is now known to depend upon (1) a low water-cement ratio, (2) the use of more cement, (3) as coarse aggregate as is possible.

Concrete pavements are now laid in Chicago and opened to traffic in three days. The mix contains 4½ gal. water per sack of cement and about 2 bbl. of cement per cubic yard of concrete.

Papers of General Interest

AMONG the papers not directly relating to aggregate and cement were two which none the less are of interest to producers from the somewhat novel ideas they bring out as to the use of these products.

John J. Early on Stucco

The first of these was on portland cement stucco by **John J. Early,** best known among the artistic American workers in concrete.

Mr. Early's paper began with a study of ancient methods of applying stucco. The old workers recognized two states, a wet and a dry mix. They also held the lime stuccos used in those days for a long time "in order that a glutinous substance might develop." We have learned in our own way what they learned, that stucco materials must have energy applied to them and that they must have water. The art of plastering is as old as Egypt, and about the first principle learned by the ancients was that the plaster existed in a succession of stages. It was also learned that energy with a little water took less effort than energy and less water. Water works wonders with plastic materials.

There is a "glutinous substance" in portland cement similar to that developed in the lime in the old days, but we have had to adopt a different technique.

Other speakers had mentioned the possibility of placing concrete with more water than was required to hydrate the cement and then removing the excess. The whole theory of plastering by successive coats depends upon this principle. A stiff mix of plaster is no good; the mix should be wet enough to be workable. The excess water is then removed by being absorbed by the coat beneath, which is purposely made absorbent, and by being brought to the surface by manipulation where it can be evaporated by the air. Time is important in this and much work must be done to prevent crazing.

What had been said about using excess water and then removing it should not be construed as a permission to use water freely and without regard to the consequences of doing so. It is only a privilege extended to the skilled craftsman who knows how to put in sufficient water with his original mix to render it smoothly workable and then extract the excess water, leaving only the proper amount for the hydration of the cement.

Unusual Method of Laying Concrete Pavements

At first sight there would seem to be no connection between plastering a wall and laying a concrete pavement, but the paper by **T. H. Johnson,** of Sioux City, Iowa, brought out a considerable relationship, so far as the method of using an absorbtive base and removing the excess water by manipulation is concerned. In the discussion which followed Mr. Johnson's paper, Mr. Early himself called attention to the similarity of the method to that of the plaster's art.

Mr. Johnson has been called a heretic and a revolutionist for his ideas of concrete paving, but he has been laying concrete pavements since 1911, when he was city engineer for Sioux City, and each year has laid an increasing number of yards by his method. At present there are about 2,000,000 yd. of his pavement in use. The pavements laid in Sioux City in 1911 are in excellent condition today, many of them after years of heavy traffic, and the maintenance cost has been very small.

Mr. Johnson's method is to lay a plain concrete pavement, usually 6 in. thick, without any reinforcing. The mix used is 1-2-4½, which requires considerably less cement than the 1-1½-3 mix in common use. Especial attention is paid to having the base absorbtive and to secure this condition the base is scarified and lightly rolled. The lightness of the rolling is important, as with heavier rolling the ground has been found to swell.

The concrete is mixed to a workable condition. Mr. Johnson said he did not know either the water-cement ratio or the slump, as attention was directed more toward getting a good, workable concrete than obtaining a certain slump. One of the members who had visited Sioux City to see the work

said that the concrete appeared to have a slump between 3 in. and 4 in.

As soon as the concrete is spread with shovels manipulation begins. The concrete is worked with a belt as long as possible and then with wooden floats. These floats are 2 ft. square, of 2-in. oak boards, fastened to a long handle, and they are pushed back and forth over the pavement until the concrete is thoroughly compacted and the water is drawn to the top, where it has a chance to evaporate.

The finish is made by putting on a dry mix, half cement and half sand, and floating it in. This rich, dry mix absorbs some of the water that is brought to the top, besides leaving the surface in a smooth condition. The final result is 5000-lb. concrete.

Mr. Johnson gave cost figures of laying pavement based on the prices of cement, aggregate and labor at Sioux City. This was $1.69 per square yard for a 6-in. slab, with a 5-year guarantee, last year.

It seemed to him that with the conventional method of laying pavement there was a waste of cement which was used only to secure workability. His method used sufficient water to secure workability and then extracted the surplus, leaving only what was necessary to secure hydration. There was nothing in the method that conflicted with the water-cement ratio theory; in fact, it was really based on that theory.

Concrete for the Wacker Drive

At every meeting of the Institute interesting papers describing some large and important public work in concrete construction are read. This year the paper of this type which attracted the most attention was called Notes on Concrete, Wacker Drive, Chicago (a double decked street) by **Arthur T. Lord,** of Lord and Hollinger, consulting engineer to the Board of Local Improvements, Chicago.

Mr. Lord's paper was interesting not only from the technical but the human side, as it took into account some of the difficulties encountered from the opposition of those who "do not believe in experts."

The work on the job went on through all weathers, even including a blizzard. This made the matter of temperature very important, for, as Mr. Lord points out, "temperature will affect strength as definitely and as greatly as the water-cement relationship." Both temperature and consistency were the subject of careful control.

The aggregates used were mainly sand and crushed stone purchased in Chicago. Sand specifications were:

No. 4 sieve, not less than 85% passing.
No. 50 sieve, not more than 30% and not less than 10% passing.
No. 100 sieve, not more than 2% passing.
Decantation test, not more than 3% removed.

Crushed stone was divided into three classes and the specification for each were:

Coarse Aggregate Designation	Percentage by weighting passing through Standard sieves with square openings				
	3-in.	1½-in.	¾-in.	⅜-in.	No. 4
No. 1				Min. 95	Max. 5
No. 2			Min. 90	20-40	Max. 5
No. 3		Min. 95	20-40		Max. 5

No. 1 size was used for fireproofing and encasing structural steel. No. 2 was the usual concrete stone. No. 3 was used in caissons when it could be obtained.

A period of at least three weeks was specified for sampling and proportioning tests before any material selected could be used in the structure. The moisture content in the coarse aggregate was limited to not over 2½%.

For sidewalk topping, granite screenings were specified, graded so that at least 95% by weight would pass a No. 4 sieve, not more than 20% would pass a 50 sieve, and not over 5% would pass an 80 sieve.

Gravel was used as coarse aggregate in a part of the work. The water-cement ratio was maintained by the "inundator."

"Oversanding" and the Use of Admixtures in Concrete

THE use of more sand than is required by the sacred 1:2:4 formula for concrete has received the name "oversanding." Recent investigations by many laboratory workers and others have shown that oversanding often produces greater compressive strength and increased workability. G. M. Williams, who is professor of civil engineering at the University of Saskatchewan, Canada, has investigated the subject and finds that the degree of oversanding that is beneficial depends upon the surface area of the sand used. In a letter to *Engineering News Record,* he states:

"With Potomac river aggregates, generally used in concrete construction work in the District of Columbia, tests indicated that a sand-gravel ratio of more than 0.5 resulted in concretes of higher compressive strength which were more easily placed and showed much less tendency to segregate in the wetter consistencies often necessary in structural work. For some deliveries of fine aggregate a sand-gravel ratio as high as 1.0 gave best concretes while for other lots any increase *over 0.5* appeared to reduce compressive strength. It was apparent that the fineness of the sand, most conveniently measured and expressed by surface area, was the important factor in these variations. Sands having surface areas of less than 700 sq. in. per 100 grams permitted the use of the 1.0 ratio, while sand approaching 110 sq. in. per 100 grams gave best results in about a 0.5 ratio. Repeated tests showed such "oversanded" concretes to be snperior in every respect and also slightly more economical, owing to their greater yield and the lower cost per cubic yard.

" 'Oversanding' has proven even more beneficial in concretes made with Saskatchewan aggregates used in the two largest cities of the Province. The pit run gravels contain from 60 to 90% fine aggregate in which the percentage of particles passing the No. 50 sieve is usually low. Surface areas of fine aggregate range between 350 and 500 sq. in. per 100 grams. The best quality concretes are made with a sand-gravel ratio which varies from 1.0 to 1.5. These concretes are far more easily placed and are stronger than mixtures which conform to the old 2:4 and 3:6 ratios. Incidentally these oversanded concretes require a greater quantity of mixing water in the batch, are *less dense* but are *more watertight or impermeable,* which further illustrates the lack of relation between density and watertightness, best evidenced by the fact that neat cement is lower in density than other concrete, but is impermeable. As the result of laboratory and field experience with these aggregates, we are now recommending the use of pit-run aggregate in general concrete construction work with 60% sand by weight as the basic proportion and with provision for decrease in aggregate quantity in the batch for higher sand contents which are determined at intervals by the use of a No. 4 screen and small balance.

"With cement content constant, working qualities of concrete may be improved either by (1) 'oversanding' or, (2) by use of a finer sand or modifying a coarse sand by the addition of fine particles of sand or more finely powdered materials such as hydrated lime, celite, etc. In (2) the finely powdered admixtures are no doubt much more efficient volume for volume than fine sand particles. The use of either method (1) or (2) requires more mixing water in the batch if consistency or flowability is to be kept constant. For structural concretes I have never encountered a case of lack of workability or segregation due to coarse sands which could not be corrected by change of sand-gravel proportions or 'oversanding,' at the same time maintaining flowability and strength without the use of additional cement. In road concretes the 'trowelling' workability, a factor of little or no importance in structural concretes, is a necessary characteristic and can possibly be best obtained where sands are deficient by the use of some type of powdered admixture, or by a combination of 'oversanding' and admixture. Such additions will increase yield and decrease density, but this density change is not usually important."

Cement From Black Sea

THERE was an unconfirmed rumor in shipping circles in New York City recently that two carloads of cement have cleared from Soviet Black Sea ports for Atlantic range destination. A similar cargo which reached Staten Island some time ago has been discharged and, it is said, disposed of.—*New York Commercial.*

How the Iowa Limestone Company Keeps Accidents at a Minimum

An Analysis by an Insurance Man

By J. P. Otis
Safety Engineer, Employers Mutual Casualty Co., Des Moines, Iowa

"A CAREFUL MAN is the best known safety device."

An understanding of this simple and yet rarely appreciated fact accounts for the splendid record enjoyed by the Iowa Limestone Co. of Des Moines and Alden, Iowa.

Not that the company has neglected the installation of proper safety devices. On the contrary, a thorough study has been made on safety methods as applied to quarrying, with the result that the Iowa Limestone Co. quarries provide as safe a working place for its employes as any in the country. Its crushers and other machinery are as fully guarded as is possible—every precaution is taken to insure the safety of the workman.

But—a careless, thoughtless man can fool the most foolproof of safety devices. There is a proverb to the effect that the fool and the criminal always are punished in the end, but the fool first. Eighty-five per cent of all accidents which occur daily in the United States are the result of carelessness—and among industrial accidents this carelessness is almost always traceable to the employe.

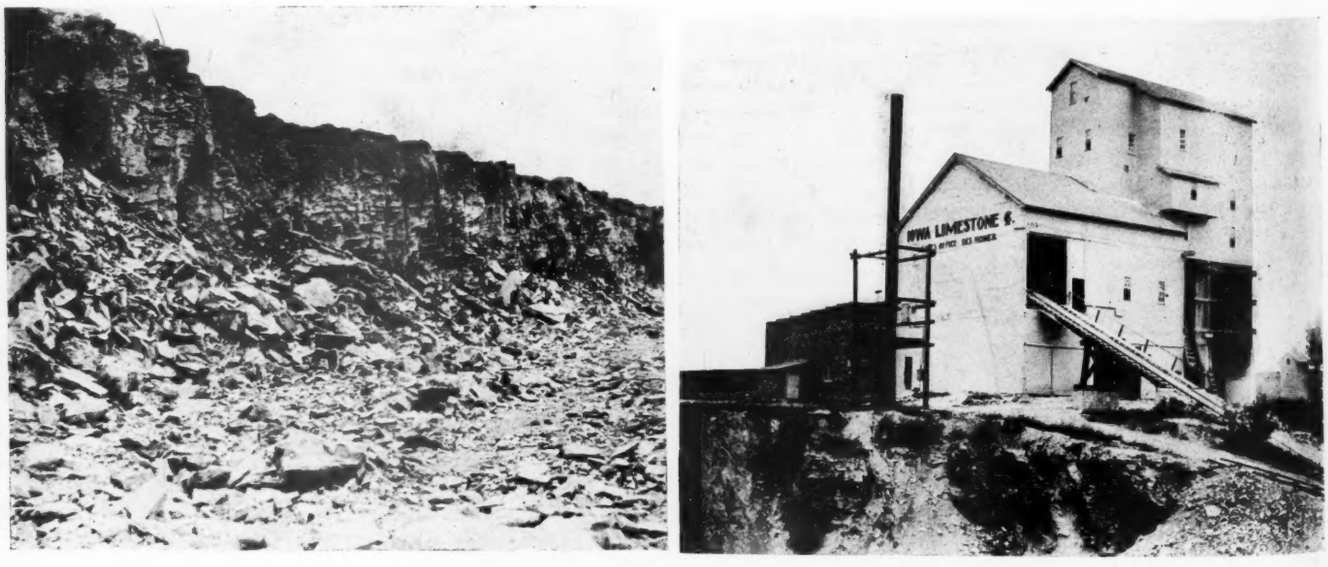
No workman fools or takes chances with dynamite—or if he does, not more than once. But employers often entrust the handling of blasts to men who fail to appreciate its dangerous potentialities. At Dubuque, Iowa, last summer a heavy charge was placed under rock which had been loosened by a previous blast. The workmen retired to the usual distance—but the superintendent in charge failed to realize that the rock was loose. Instead of falling reasonably close to the charge, as would have been the case had the blast been placed in solid rock, pieces were hurled hundreds of yards. Result—two men killed, two others injured more or less seriously, and considerable property damaged. No fault could be found in the equipment—merely a proper lack of understanding of his business by the man in charge.

R. C. FLETCHER, vice president of the Flint Crushed Gravel Co. and of the Iowa Limestone Co., Des Moines, Iowa, happened to tell one of the editors he had recently received a substantial reduction in his workmen's compensation insurance rate on his quarry and crushing plant. Being too modest to go into details, the editor went to the one man who could explain the good no-accident record which resulted in this reduction of rates. This is his explanation.

—The Editors.

Superintending the plant at Alden is J. A. Owen, a man with twenty years' experience in handling rock and blasting. During those twenty years, two of which were spent in France, where he had charge of government explosives on one of the most important sectors, no employe under Mr. Owen has ever been injured by blasted rock. In selecting Mr. Owen, the officials of the Iowa Limestone Co. have found a man who not only knows his business thoroughly, but who believes in and practices caution systematically and every day in the year.

The quarry, a view of which is shown in the illustration on this page, is a quarry of limestone, which the Iowa Limestone Co. prepares both for road and industrial use. Blasting is always done on the opposite side of the quarry from where the rock is being removed and loaded. Drilling is never done closer than 200 yd. from where men are working, and before a blast is set off, every man is removed to a safe distance. An old employe with eight years of experience does the loading, supervised by the superintendent personally, who sees that each hole is properly loaded and uses two caps to each hole to insure a shot for every hole. The firing battery is located 200 ft. in the rear of the rock to be blasted, and the entire quarry is cleared of workmen before firing. When the blast has been completed the loading of small dump cars



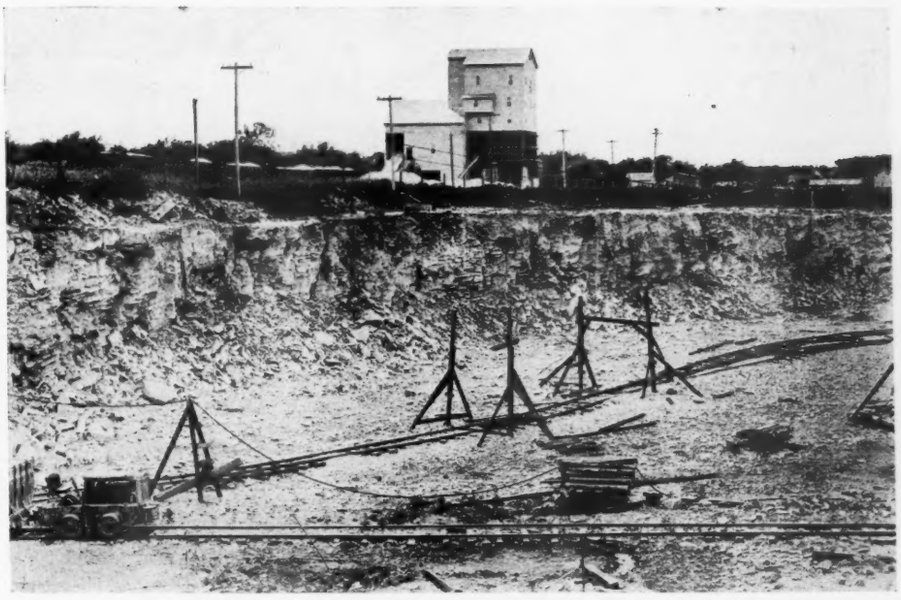
Quarry and crushing plant of Iowa Limestone Co. at Alden, Iowa

is done by steam shovel and hand, the loaded cars are moved in the quarry by gasoline locomotives to a runway, and are hauled to crushing plant on small gage track to the large gyratory crusher where the plant work begins.

To this stage of the process, equipment is merely a side issue. Dependable blasting material must of course be used—but it is the intelligent, cautious, painstaking care of those in charge that makes a quarry a safe place for men to work.

Though a small plant, the crushing mill is very well designed and equipped. By the use of three gyratory crushers of graduated sizes, bucket elevators of the type used in every plant, and the usual screens, no material is wasted. After passing through the large crusher the rock is screened and the larger pieces put through a second crusher of finer grinding capacity. Still a third crusher completes the process. The capacity of the plant is 1500 tons a day.

Despite every item of forethought and providing of equipment by the officials of the company, the safety of the workmen in the quarries rests in the hands of the superintendent in charge. A superintendent who realizes that no chances can be taken with dynamite, and who acts accordingly, is a valuable asset to any firm in the quarrying industry.



Quarry floor and narrow gage loading track at Iowa Limestone Co., Alden, Iowa

Engineers and Architects Asked to Use American Materials

CEMENT, gypsum and other building material manufacturers have a committee at work in New York on a proposal whereby architects and engineers are going to be asked to pinch hit for a defective tariff until impost laws in this country can be put in condition to keep American building material manufacturing industries profitably employed, according to Allen E. Beals in the current *Dow Service Daily Building Reports.*

Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, brought the building material manufacturers to a sudden realization that it was time to do something to resist the underselling of American made building materials by similar products from Europe, when he showed that 1926 closed with a trade balance in favor of the United States of only $350,000,000, "the smallest trade balance in our favor since 1910." The average trade balance in favor of the United States from 1921 to 1925 was $947,000,000.

When the committee found in this same report that American exports for 1926 showed a decrease of 2% under 1925 records, while imports showed a growth of 5%, making a shift against the United States of 7%, and that during the last fiscal year imports of $4,466,000,000 represented an increase of 71% in the last three years, it was abashed, to say the least, to figure out that at least four years must elapse before any hope for relief could be obtained under the tariff laws.

That is how it came to be decided to make an appeal to the architects and engineers of the country to essay the role of saviors of national building prosperity by the simple expedient of specifying that only American-made building materials be used on structures in their charge.

The present Congress is completing its labors. The next Congress meets in December and it is hardly to be expected that tariff revision will be undertaken preceding the national political conventions nor immediately following them. The next national election will not occur until November, 1928, and the next administration will not assume its duties until the spring of 1929. It is, therefore, quite unlikely that the subject of tariff revision can be expected to receive much attention from Congress before the late session of 1929, with small prospects of the building material manufacturing industry deriving any beneficial effects therefrom until well into 1931.

Meantime the inflooding of foreign made building material into Atlantic coast markets, particularly, is increasing.

Only within a few weeks the retail price of portland cement in this market dropped from $2.90 and $3.10 to $2.75 and $2.95, after remaining in one price position for far more than a year.

The first thought of the casual reader may be that if European-made building materials can bring American building material prices down, so that building construction will be lower in cost, it is a good thing and anything that can accomplish such a result ought to be encouraged.

As a matter of fact, however, building construction costs already show a turn from their constantly ascending course. The index figure peak for Atlantic coast cities in 1921, for example, was 210.3; in 1922, 198.9; 1923, 173.7; 1924, 169.2; 1925, 158.6, and 1926 (general wage increases took effect this year in the spring in New York City and vicinity), 161.3. In January, 1927, however, the index figure showed that this year was proceeding on a basis indicating a still lower level.

Furthermore, Bradstreet's report on basic building material price trend for January 1 shows that building material prices have declined from a February, 1920, figure of 0.2370 to a January, 1927, figure of 0.1326.

Until last year declines in price were not forced by competition with European-made building materials, but 1926 changed the story. Further enforced cuts can only result in lower geared American mills, which, by use of highly improved machinery as opposed to hand-power abroad, makes it possible to produce building material at low cost to offset the high wage standards of American workmen employed on these plants. When production declines, overhead expenses increase, and when markets are not active for American-made materials, employment declines.

To avoid this sort of situation, architects and engineers of America are going to be asked to use their great prerogatives by specifying the use of only American-made building materials.

Twenty-Five Years Ago and Now

THE St. Louis (Mo.) *Star,* is running a series of portraits of prominent local business men, as they looked 25 years ago, and as they look today. The January 22 issue contains these two portraits of Gordon Willis, president of the Hunkins-Willis Lime and Cement Co. These portraits must be very interesting to a host of friends and business acquaintances, and must arouse quite a train of reminiscenses.

Source and Origin of Limestone Deposits

How Limestones May Be Classified According to Formation and Characteristics

By Arthur C. Avril
Mining Engineer and Geologist of the France Stone Co., Toledo, Ohio

LIMESTONE is generally defined as a rock in which calcium carbonate is the chief ingredient. The commercial definition adopted by the National Lime Manufacturers Association, however, includes specific limits of the calcium and magnesium carbonate content by stating that limestone is a rock varying in composition, when free from impurities, from pure calcium carbonate to a mixture of 54.35% of calcium carbonate and 45.65% of magnesium carbonate.

There are no known limestones, in sufficient quantities for commercial use, that are without some impurities which occur either in chemical combination with calcium and magnesium carbonates or as separate minerals. The most common impurities are iron carbonates, iron oxides and sulphides, silica, alumina, sulphur, phosphorous and carbonaceous matter.

As we know limestones, they exist in the various colors, black, blue, drab, yellow, red, pink and brown. The drab, yellow, red and brown tones are due to the presence of iron oxides, the blue to either carbonaceous material or iron oxide, the gray to aluminium compounds of carbonaceous material and the black to carbonaceous matter.

The original sources of limestone are the igneous rocks containing calcium compounds such as lime feldspar, trap rock, and other lime-bearing rocks. The process of limestone formation is possible because of the ground water absorbing carbon dioxide given off by decaying vegetable and animal matter. This action forms a weak solution of carbonic acid which decomposes the igneous rock and takes calcium carbonate into solution. The waters containing the calcium carbonate are carried to the sea by the streams and rivers. Over a long period, this action, combined with the evaporation of water from the sea, concentrates the solution to the point where it can no longer carry the calcium carbonate. When it reaches this point either precipitation occurs, forming an inorganic deposit of limestone, or the calcium carbonate is consumed by some agency of deposition like calcareous organisms or bacteria, forming an organic deposit. Usually both methods are at work at the same time.

Inorganic Limestone Deposits

The direct precipitation method of making a limestone formation, is classed as inorganic deposition.

There is a definite maximum amount of any mineral or salt that can be carried in solution by water. When more of the mineral is in contact with the water than can be dissolved, it settles out as a precipitate. This action, constantly repeated, takes place in the formation of inorganic deposits. Because of the exceptional conditions nesessary for inorganic deposition to take place, few typical examples are generally known. One of the usual conditions for forming an inorganic deposit is for the water carrying calcium carbonate to contain a large percentage of carbon dioxide, the removal of which causes precipitation to occur. Rapid evaporation and sudden cooling of the water are also agencies that are instrumental in accelerating the precipitation.

The stalactites and stalagmites in caves are formed by mineral waters giving up carbon dioxide and also by evaporation. Limestone deposits at the mouths of hot springs result from evaporation of the water in vapors. Local beds due to excessive heat and evaporation, causing an overcharged condition in the water, are at present being deposited in the Everglades in Florida.

Organic Limestone Deposits

Organic limestones are deposited by organisms that are constantly removing calcium carbonate from the water and which either pass it through the body as waste material to form what is commonly called calcareous ooze, or consume it to become a part of their bodies as shells, bones or teeth. In the latter case, these calcareous parts of the organisms pile up on the bottom of the sea and are cemented together by calcareous ooze, inorganic deposits and other fine particles of calcareous material which are usually formed by bacterial action. This is in brief the most common way in which limestones are formed.

In the past it was believed that all dense,

Face of Columbus and Delaware dolomitic limestone after blasting

The Lucas dolomite, a high calcium stone of the Monroe formation

A stratified face of the Rasin River dolomite

Another kind of limestone in the Columbus and Delaware formation

fine-grained limestones were of inorganic origin. This theory has been disproved in most cases and it is now believed that these apparently inorganic deposits are in reality organic, the dense condition being due to re-crystallization after deposition, bacterial action, and the action of waves which ground the lime organisms into small particles. There are any number of limestones, which we know to be of organic origin, that have been so completely transformed by re-crystallization, that the organic structure is entirely obliterated. One of the most pronounced examples of this condition may be seen in some of the beds of the Monroe (Helderberg) formation of southeastern Michigan and northwestern Ohio. As a specific example, the Lucas dolomite of this formation is a dense, apparently inorganic deposit because there are no fossils present that are visible to the eye. There are numerous calcite crystals disseminated through the entire formation ranging in size from microscopic to clusters as big as a man's head. All of these conditions would indicate an inorganic origin, but upon close inspection with a magnifying glass, minute fragments of fossils can be detected.

Bacterial deposits and formations made up of calcareous ooze, are also deceptive in appearance as to their origin. Because of the nature of the deposition, stones formed in this way are dense in structure. An example of this type is the Tymochtee division of the Monroe formation. Outcrops and quarries operating it, in Ohio, extend in a north and south line from North Baltimore to Kenton.

Dense limestones formed by the action of waves tearing down the structure of the fossils and practically obliterating them may be found in the northeast part of the Lower Peninsula of Michigan. At present, a large quarry is operating at Rockport, Michigan, in a deposit that is typically of this nature. It is a dense black limestone showing occasional fragments of coral and other fossils. There are similar limestones now being formed in the bottom of the sea, especially around modern coral reefs. It is easy to see this action taking place by noting the milky appearance of the water, after a severe storm, within a radius of several miles of the reef.

As stated before, most of the limestones are formed by the combined action of bacteria, other organic life and some inorganic actions. In this classification we have a very wide assortment of different structures. Some are predominantly fossiliferous like the Niagara limestone from which the nationally known Woodville finishing lime is made, and some are made up of irregular patches of fossil areas and dense material intermittently, such as the Helderberg limestones of New York, Pennsylvania, Indiana and Ohio. There are also deposits uniform in appearance, called oolitic limestone, which are most usually made up of oolites and very small fragments of fossils cemented together by finely divided calcareous material. The most typical example is the Bedford limestone of Indiana from which the well-known building stone is quarried. (Oolites are small round bodies formed from the clots or floes that form during the precipitation of inorganic lime. The word originally meant fish eggs. Pisolites are larger bodies of the same kind.)

Industrial Classifications

Industrial classifications are not usually made according to the method of deposition, but according to either texture or chemical composition. Classifying according to texture, limestones are known as:

1. Compact, dense, fine-grained. (Dayton L. S. of Ohio.)
2. Crystalline limestone. (Brassfield of Ohio, Mitchell of Indiana.)
3. Oolitic and pisolitic. (Bedford of Indiana.)
4. Fossiliferous limestone. (Niagara of Ohio, Dundee of Michigan.)
5. Shell limestone. (Upper part of Delaware L. S. of Ohio.)
6. Chalky limestone. (Chalk cliffs of England.)
7. Conglomeratic limestone and brecciated limestone. (Raisin River division of Monroe formation.)
8. Cherty limestone. (Columbus formation of Ohio.)
9. Stalactitic and stalagmitic limestone. (Cavern deposits Mammoth Cave, Ky.)

Classifying according to chemical composition there are five general types:

1. High calcium. (Long Lake series at Alpena, Mich., Mitchell and Salem L. S. of Indiana and Dundee of Michigan.)
2. Magnesian limestone. (Niagara L. S. of Ohio and Indiana.)
3. Dolomite. (Lucas dolomite of the Monroe formation in Ohio.)
4. Argillaceous limestone. (Tymochtee division of the Monroe.)
5. Arenaceous and siliceous limestone. (Columbus formation.)

These classifications according to texture and composition cannot be applied generally because usually, in the same formation, several varieties, from the standpoints of texture and composition, are found intermingled.

Tennessee as a Cement Producer

SOME interesting figures on cement production in Tennessee have been compiled by O. P. Pile, director of the division of mines, which show that in 1926 the value of the product from the four plants in the state amounted to $7,895,760 as against a total of $7,298,382 for 1925. The number of employes, however, decreased from 839 to 797. These four plants paid out for labor in 1926, $1,110,433 as compared with $1,188,742 in 1925, and the average wage per day in 1926 was $3.82. The quantity of cement produced in 1926 was 5,221,814 bbl.

The four cement plants now being operated in Tennessee are the Pennsylvania-Dixie Cement Corp. at Richard City; the Pennsylvania-Dixie Cement Corp., at Kingsport; the Hermitage Portland Cement Co., at Nashville, and the Signal Mountain Portland Cement Co., at Chattanooga. A fifth plant is nearing completion at Cowan, Tenn., to be known as the Cumberland Portland Cement Co.

STATE CEMENT PLANTS—For Peace and Goodwill Among Citizens, May They Cease to Be!

OUR mail the past few months has been filled with newspaper clippings of the vicissitudes of the Michigan state cement plant at Chelsea, which are given in some detail further along in this article. The same mails bring news of the perennial attempts to build state cement plants in other states—just now in Indiana, Oklahoma and Washington.

In Indiana a bill introduced by Representative Russell V. Duncan of Indianapolis would have prisoners at the Putnamville farm employed in the manufacture of cement at pay not to exceed $1.50 a day. The measure provides an appropriation of $250,000 the first year and $350,000 the second for construction, equipment and maintenance of the plant.

In Oklahoma, a state owned and operated cement plant is proposed in a bill introduced by Dave Boyer, senator from Walters. An appropriation of $2,000,000 is carried in the bill, which does not specifically mention cement, but provides for the purchase of land and building of plants to furnish supplies for the state highway department and for the construction of highways.

In Washington State a bill introduced in the Senate by Senator W. H. Kirkman of Walla Walla, proposing that the state of Washington go into the cement manufacturing business provides for the acquisition of a cement manufacturing site "for the use and benefit of the state under the direction of the governor."

In South Dakota, where they have a state cement plant, which last year operated at a "profit" of about $5,000 less than the mere interest on the bonds issued for its construction, the news dispatches say "the sales policy will be continued and no changes are now in contemplation in the working or selling force at the plant, it was stated by new members of the cement commission."

The Michigan Mixup

The Michigan state cement plant has long been a hot-bed of politics. It was one of the hobbies of former Governor Groesbeck, and, incidentally, one of the causes of his defeat for re-election. Therefore, to properly understand the present status of the controversy it is well to go back to December 22, 1926, before Governor Groesbeck went out of office; on that date the *Detroit Free Press* Lansing correspondent sent a dispatch to his paper, which contained the following information:

"In order to complete the purchase of the Chelsea cement plant and close the questionable contract through which the state took it over, the expiring administration has doubled the deficit of the cement plant fund and issued promissory notes obligating officials who will serve under Governor-elect Fred Green, it was revealed today.

"The return of the politically famed Chelsea deal into the spotlight of state affairs occurred today, when the deed for the plant was turned over to O. B. Fuller, auditor general, for recording. The transaction was completed quietly. Members of the Green administration see in the maneuver a strategic move engineered by Governor Alex Groesbeck to entangle further the affairs of the plant and close the contract which the governor-elect had declared to be illegal.

Promised Investigation

"Governor-elect Green has promised an investigation of the transaction through which the state paid $500,000 for the plant, and there have been rumors that suit would be started by W. W. Potter, the incoming attorney general, for the return of the money. By paying the debt and closing the contract the Groesbeck officials are believed to have hampered somewhat Potter's plans.

"A payment of $50,000 on the plant was made last week from the cement plant fund. Since then the deficit in the fund has been increasing daily, and the auditor general's books today showed the fund $106,000 in arrears.

"At the same time the payment was made the former owners of the plant were given three promissory notes for $50,000 each, signed by the members of the prison commission, which has been operating the industry with prison labor. The notes do not bear interest, and are for four, eight and twelve months respectively.

"The transaction was handled and declared to be legal by Attorney General Clare Retan. Henry Croll, budget director, said today he knew little about it, and when asked whether the Chelsea plant had earned enough money this year to warrant overdrawing its fund to meet the $50,000 payment, he refused to go into the matter.

"The purchase of this industry created a roar of protest among the voters long before Governor Groesbeck announced his candidacy for a fourth term. During the campaign it was used continuously as a weapon by his opponents.

"Decision to buy the plant was made by the administrative board, and to this day the legislature has not been informed officially that the state is engaged in the cement business. The industry was bought from the heirs of the late Nathan S. Potter, Sr., among them Kennedy Potter, chairman of the state Republican committee and former law partner of Secretary of State Charles Deland. The plant never had been operated profitably, a subsequent investigation showed, and Edward Frensdorf, one-time Democratic nominee for governor, testified he had been offered the plant by Nathan S. Potter, Sr., for $90,000."

C. H. Sonntag Makes Report

Developments after Governor Green took office are told in the following article from the *Detroit Free Press:*

Lansing, February 9—The notorious Groesbeck state-owned cement plant crumbled in the legislature this afternoon. Recommendation was made that operation of it be discontinued in a report of an examination of the physical property of the plant at Chelsea which was turned over to the legislature by Governor Fred W. Green.

"The recommendation is based on a study of the property made by C. H. Sonntag, an independent cement plant engineer from Cape Girardeau, Mo. Previously he was a chemist for several portland cement companies and has been identified with the trade since 1900.

"The plant is described as having been

Editor's Note

OUR purpose in republishing all these newspaper reports of the Michigan state cement plant scandal is threefold:

(1) That the wider circulation given these reports by a journal of national circulation in the portland cement and allied industries may result indirectly in their publicity coming to the attention of would-be state cement plant exponents in other states.

(2) That irrespective of the truth or accuracy of the charges made against the management of this plant the publicity given these charges may serve as a warning to self-respecting cement men of the dangers to their reputations by acceptance of political jobs of this kind, under politics as at present practiced.

(3) That all who read may be convinced of the futility of attempting any governmental business enterprises with ever-changing politicians in control.

Government competition in the rock products industries is a serious menace, largely because state and local governments are large purchasers of these construction materials, and because their production LOOKS simple to the uninitiated. The ignorance of the uninitiated can be overcome only by education — likewise the indifference of the general public.

wasteful of state moneys, with costs excessive as compared to those private plants; destructive to the concrete highway system of Michigan because of the poor quality of cement that is produced; and something that 'the state was not justified in taking control of and purchasing, for it did not get actual value in exchange.'

Costs Are Shown

"For weeks auditors have been going over the books at Chelsea and at Jackson, both the prison and the cement industry being under the jurisdiction of the Groesbeck prison commission. Their work is not yet completed. Following a report that there had been mutilation of records at the plant, the governor suspended L. L. Griffith, the superintendent, and his son, the assistant superintendent, and members of the attorney general's staff began a check up of their activities. They have not yet reported any findings to the governor.

"In part Mr. Sonntag's report submitted to the legislature follows":

The land is of no value for agricultural purposes, apparently contains no marl, and is partly covered by water. The clay, while good, is no better than can be found in many other places in the vicinity. The land is now carried on the books as an asset valued at $120,000 or an approximate value of $170 per acre. Good farm land in this region is worth around $125 to $135 per acre. It is believed that the company holdings should not be valued at more than $50 an acre, or $35,000.

Rock is costing 60 cents per ton of 2000 lb. f. o. b. cars Detroit district, plus a freight charge of 60 cents per ton, making the rock cost $1.20 per ton at the mill. This freight is an added cost to this mill over that to waterside plants at Detroit. Mills operating their own quarries usually get rock to their mill for about 70 cents per ton, in other words, rock is costing this mill 50 cents per ton more than it costs those who quarry it themselves or get water delivery. This particular mill uses 407 lb. of rock to make a barrel of cement because there is no cheap source of lime near the plant.

I was advised that the price of 60 cents per ton f. o. b. cars Detroit was made because of friendship between the owner of the plant and the owner of the quarries at Calcite, and also because the fine stone used was an unsalable product of the crusher at that time. Since then a considerable market for this stone has been developed, and there is a possibility that the price may be raised about 30 cents per ton, which would mean an added burden of 6 cents per barrel on every barrel of cement made.

Power Plant Faulty

The whole power plant is inadequate to operate the mill, or more than half of it. It did not represent good practice even when it was built, and it would use twice as much coal to produce a kilowatt hour as would be needed in a modern plant. The shutting down stop on the engine is not automatic, and it is probably due to this that nine years ago when one of the main driving belts broke the engine ran away and burst its fly wheel, which was replaced by a wooden one. So much steam is used around the plant for heating purposes that three boilers are kept fired up to supply it and two would be sufficient if the stack were higher.

This whole power plant is placed at a valuation that is absurd, for it is completely and totally obsolete and its value, except the boilers, is that of its weight in junk only. The boiler settings, because of advances in the art of steam generation, have become a liability rather than an asset, and it is recommended that the boilers be reset with higher modern settings, the cost of the work to become a capital charge, and the value of the bare boilers be taken at not over $6000, because of their age. Before doing this work the matter should be taken up with the boiler insurance company to learn the conditions under which they will permit the change.

The engine and boiler rooms have brick walls with wooden roofs. They are fire risks and probably raise the premium of fire insurance. They are about 15 years old and under proper accounting methods would have been depreciated practically the entire cost by this time.

Power Costs Excessive

The pumps are still in operating condition, but are quite badly worn and should also have been depreciated their full value.

All the power to run the mill is now purchased from the Consumers Power Co. This contract carries a basic rate of 0.8 cent per kilowatt hour, but it also carries a very heavy "demand" or "readiness to serve" charge, which is in addition to the energy rate, and which brings the total cost of power to a figure that varies between 1.2 cents and 1.3 cents per kilowatt hour from month to month when the mill is in full operation, and to a much higher figure during shut downs. This is considerably higher than other cement mills are paying, and if it cannot be reduced, it would justify the erection of a waste-heat power plant, if the mill is to be kept in operation, for power can be generated in this way for about 0.8 cent per kilowatt hour after paying all proper charges. It is possible that if this thought is placed before the power company they may bring their rate more into conformity with those applying to cement mills in other sections of the country.

The raw grinding machinery consists of two kominuters and three tube mills. One of the former was permitted to run with a cracked shaft until it was practically wrecked. I was informed that repairs to date have cost $3750, which is nearly the price of a new mill. There was warning of this accident before it happened. The tube mills were once standard machines but have become largely obsolete due to advances in the art and should be carried on the books at not over half their original, not their reproduction cost. Their drives could be modernized at an expense of about $5000 apiece.

Equipment Is Obsolete

Slurry tanks are suitable for storage tanks, but as a means of correcting the composite of the slurry, they are of very little value, for they are not fitted with proper agitators. The laboratory records show variations of as much as 2½% in the lime content of the slurry, which is fatal to the manufacturers of a uniformly good product.

In the kiln room there are three 8x125-ft. kilns. Air is supplied by three high speed belted fans driven from a line shaft and a single 100-hp. motor and discharging into a common pipe. This whole installation is entirely obsolete and should be replaced, as its operation is extremely costly. One of the fan bearings burned out while the writer was watching it, and it appeared to be a frequent occurrence.

The kilns have been operated many times with holes burned through the linings and the lower ends are so badly warped that they will not turn inside the firing hoods, which in consequence are set 6 or 8 in. away from the ends of the kiln, and this apparently was considered good practice. It is not so considered by other cement makers.

The entire gear train on No. 2 kiln, including the girth gear, is in very bad shape and practically worthless. Those on the other two kilns are in fair condition. The kilns are driven by individual motors through long belts, and the motors have only two speeds. This is not in line with modern practice.

Coal Mill Is Menace

All the kilns discharge their gas into a common flue leading to a concrete stack. The roof of the flue has partly collapsed and has been temporarily repaired, but is in dangerous condition and may cause a shutdown at any time. The dampers between the kilns and the stacks are not adequate and are frequently left open when one or two kilns are shut down. The concrete stack was in a failing condition and an outer concrete jacket was put on it last summer, but the job was not completed.

It would take about $30,000 to put these kilns in good condition.

The coal mill contains a hammer mill, two rotary dryers and three No. 33 Fuller mills driven by 75-hp. motors through quarter driven belts. The hammer mill was, as far as could be seen, in good condition. The dryers are not large enough and the coal leaving them was wet and steaming, but hardly warm. The No. 33 Fuller mills have been discarded by everyone who has used them. The motors driving them are twice as large as is necessary.

The whole coal mill is entirely obsolete and should be written off the books. It is a positive menace, for it is so dusty that there is constant danger of an explosion.

An entirely new and modern coal mill would cost about $100,000.

Clinker grinding is done in two stages, the preliminary breakdown being by two No. 57 Fuller mills and two Sturtevant ring roll mills. So far as clinker grinding is concerned, all of these machines are out of date and obsolete. The Fuller mills would do excellently for coal grinding if put in a rebuilt coal mill, but the Sturtevant mills should be junked.

It would cost about $60,000 to put in a modern preliminary grinding equipment.

Too Many Men Employed

Plant records show that the power used per barrel is extravagant, and shows a progressive increase for which no reason is apparent. They show about the highest power consumption of any cement mill in the country, in spite of the fact that neither quarry, crushing plant nor waste-heat boilers are operated. This, in connection with the high price paid for power, makes the cost of this item per barrel excessive, and the whole matter should be thoroughly investigated.

It is evident to one familiar with the industry that too many men are employed in the mill. This labor question was not looked into carefully, because of lack of time, but it appears on the surface that there are many free men rated and paid as foremen, while inmates do much of the work. Most of these men should be actual laborers and not foremen, as the mill is not large enough to have department foremen.

The basic pay rate of these men does not

seem to be too high, but the pernicious bonus system in force increases this rate by about 30%.

Conclusions: The White Portland Cement Co. and its successor, the Millen Portland Cement Co., were commercial failures because the mill they were trying to operate was obsolete, but they carried their land and buildings on their books at a value out of all proportion to its real worth. The price actually paid for the land should be ascertained if possible.

The state is not justified in continuing the operation of this plant unless it can be shown that it can use the entire output and can save a considerable sum by doing so as compared to the purchase of its cement at requirements on the open market. In doing this the entire investment in fixed assets should be written off in a very few years, and the same accounting methods as are used in privately owned plants should be adopted.

Made a Torture Mill?

A still later reference to the cement plant investigation in the *Lansing Journal*, February 15, says:

"Cruelties and inhumanities worthy of the most talented tortures of the dark ages are charged against the management of the Chelsea cement plant in its treatment of prison labor at the institution in a 16-page special report filed with Gov. Fred W. Green late Monday by William J. Galbraith and Kit F. Clardy, assistant attorneys general.

"The typewritten report bristles with reference to 'buried' prisoners, men being chained in inhuman and unnatural positions for 18 and 20 hours, men being poisoned by their work and allowed to go untreated, poisoned food calculated to cause illness of the men who ate it, starvation rations for days at a stretch and the administration of drugs to alleged recalcitrant men. The report is the first to be received by the governor concerning the investigation into the institutional management of the cement plant.

"The report touching upon 'discipline vs. brutality' contains the statement: 'Inmates were men before they were incarcerated, and are men although in prison, and will again take their several places in society when released. The methods resorted to by the superintendent and his assistant were never in general vogue in any prison in the old northwest, and are not now in vogue in any Michigan penal institution except at the Chelsea cement plant.'

Penalty for Silence

"'Take him out and string him up until the maggots carry him out from under the door.' This is the exact language which is alleged to have been used by the superintendent in his directions as to the treatment to be accorded a prisoner who refused to give information concerning other prisoners. The testimony transcribed verbatim was given by an inmate designated as 'Mr. A.' by the investigators for the governor. Mr. A. testified that the assistant superintendent kept him in the bull pen under various circumstances for 33½ days, during which time his weight was reduced from 186 lb. to 144 lb.

"Another inmate testified that he had been locked in a cell with a blanket covered floor and sprayed with formaldehyde to subdue him.

Inmate Tells of Brutality

"The same inmate, continuing his testimony at the request of the investigators, said, in speaking of the superintendent: 'His method of treatment of the men would never reform them, and he antagonized them, rather, at all times. Now, if a man would put a gun in your stomach and call you some very bad names, it is only human to resent it, or if they put you in that bull pen and string you up about 24 hours at a stretch, not 12, but 24, and tell you that he had a notion to blow your d——d head off you would become hardened toward prisons and civilians and everything else.'

"Mr. D. testified that he was chained, 'pretty close' against the bars of his cell, with one hand above his head, and the other 'as low down as they could pull it' and that the marks of the chafing of his wrists remained with him for a month.

Caused Blaze

"What would, in an ordinary report, constitute startling accusations, are contained in the first part of the written record of the investigations. These parts of the report charge the management with gross negligence which was the direct cause of the disastrous fire that visited the cement plant in the summer of 1925. It was said by the assistant attorney general that a certain babbitt bearing that had given out was replaced by another bearing of brass which was not adequate for the work intended. After 26 hours of constant supervision on the part of plant employes, who called the attention of the assistant superintendent to the condition, the grease around the bearing caught fire and the flames spread throughout the building.

"In the part of the report headed 'padding' occurs the sentence: 'About 30% of the value of the old parts in the June inventory are junk.'

"One of the first acts of the investigators was to relieve from duty three high priced officers and two clerks, 'whose absence greatly improved the spirit of the plant' and reduced the annual payroll by more than $21,000."

Michigan Contract Prices for Cement

CONTRACTS for the cement to be used in the construction of Macomb county roads during 1927 were awarded this week to three companies at the rate of $2.59 per barrel, less 20 cents per barrel discount.

The contracts were given to the New Egyptian Portland Cement Co. of Port Huron, Huron Portland Cement Co. of Detroit, and the Aetna Portland Cement Co. of Fenton, Mich. The firms are to supply 21,000 bbl. which will be used in the construction of approximately 60 miles of county roads.

Cement for inter-county and state roads is not included in the contracts awarded.

Southern State Highway Departments Demand Cement in Cotton Sacks

ASSURANCES of co-operation in its campaign to increase the use of cotton sacks for cement shipments have been received by the Cotton Textile Institute, Inc., from the highway building departments of six states, according to George A. Sloan, secretary of the institute.

Favorable replies to letters urging the desirability of specifying cotton bagging for all cement used in state highway construction have been received by the institute from the state authorities of Virginia, South Carolina, Alabama, Georgia, Florida and Tennessee. In addition, notification has been received from several other states that favorable action on the matter is pending.

Clifford Walker, governor of Georgia, wrote to the institute: "You can count on my active co-operation in the fine work you are doing."

John N. Holder, chairman of the Georgia State Highway Board, has notified the institute that "It will give me great pleasure to co-operate with your association."

H. G. Shirley, chairman of the State Highway Commission of Virginia, replied: "The State Highway Commission buys all the cement used for our work in this state in cotton sacks."

J. W. Wilks, secretary-treasurer of the State Highway Department of South Carolina, has notified the institute that the commission unanimously passed a motion on December 15 specifying cotton sacks for all cement shipments.

Woolsey Finnell, director of highways for the state of Alabama, reported that his department "will require all cement bought by it to be shipped in cotton sacks."

"It is the desire of the institute to increase the demand for cotton textiles solely on the basis of their intrinsic merits," said Mr. Sloan. "For cement shipments cotton provides a more economical container than does paper, and for many purposes is more satisfactory. A study recently made by one of the cotton bag mills showed that paper-bagged cement costs $6.15 per thousand bags more than does cement in cotton sacks. This difference includes the cost of using strawboard to line the freight cars in which paper packed cement is shipped, and makes allowances for the re-use of the cotton sacks.

"Estimates show that approximately 100,000,000 paper bags were used for shipping cement last year. On this basis consumers are paying nearly $500,000 more per year for their cement than is necessary."

Profitable Profit-Sharing*

MANY employers who give thought to the problem of financial incentives and extra compensation for given results are looking seriously into the subject of profit-sharing. They ask three questions:

1. Are workers interested in profit-sharing?
2. When profit-sharing is installed, do workers become dissatisfied when there are no profits for distribution?
3. Under profit-sharing, do drones benefit equally with the industrious workers?

J. S. Baker, president of the Baker Manufacturing Co., Evansville, Wis., is in a position to contribute valuable experience to the pool of knowledge on profit-sharing plans. His company manufactures windmills, pumps and small gasoline engines. Mr. Baker says:

"Early in the nineties we became interested in breaking down the differences between capital and labor by giving each a share in the profits and so creating a bond of common interest and an incentive for co-operation between our company and its employes. Our first profit-sharing plan, offered in 1894, was not received enthusiastically because business was depressed somewhat and the weekly pay envelope looked better to our workers. Perhaps they were right.

"In 1899, however, profit-sharing became a fixture with our company. At that time our men were paid 10% cash bonus on their last year's wages and told that in the future an inventory would be taken each year and if, after paying the regular 5% dividend on all stock, there should be a gain, 10% of it was to be put into the sinking fund and the remainder divided between preferred stock (original stock) and employes with at least 4500 hours of service, in proportion to the day wages of each. Fifteen per cent of the division to employes was to be paid in cash and 85% in common stock. This plan continued until 1908. The percentage added to preferred dividends and to employes' wages during that time was: 1900, 60%; 1901, 82%; 1902, 74%; 1903, 98%; 1904, 69%; 1905, 28%; 1906, 81%; 1907, 120%.

"It soon was apparent that stock contributed as profit shares would be coming continually on the market. The men organized to buy it in to maintain the price at par; but in spite of their efforts it fell to about $65 a share ($100 par). In 1909, however, our company had plenty of capital and there was a profit in the purchase of stock below par. At that time it was deemed wise to change our policy and it was agreed to issue stock to employes only on condition that it be left on deposit with the company to be sold to the company at the market price whenever the shareholders desired. The market price is determined by averaging the price of the last 100 shares sold. Ten per cent of the employes' profit share now is paid in cash and 90% in stock.

Higher Wages or a Share in the Profits?

"Some workers have left us because of our profit-sharing plan, and a good many have come back to boost the idea. We think we have proved it to be a good thing for the company and its employes. Certainly we do not use the plan as an excuse for lower wages. We always pay a competitive wage. The State Industrial Commission publishes monthly the average wages paid in the various industries in the state and we aim to keep our wages on a level with the state's average for similar industries. In addition to their wages, our workers are building up a reserve through our profit-sharing plan."

How the Plan Steadied Business

At this point, the plant superintendent testified that he has been with the company during the entire life of the plan and has accumulated sufficient capital in the stock of the company and otherwise to be able to retire. He mentioned others who also have reached a position of economic security through the successful operation of the profit-sharing plan.

"The plan has helped to make Evansville a thrifty, prosperous community," Mr. Baker continued. "Nearly all of our married employes own their homes, possess automobiles, and maintain substantial bank accounts. That would seem to be conclusive proof of the stabilizing influence of our profit-sharing arrangement."

What Happens When There Are No Profits

"It has not been our experience that workers become restless and dissatisfied when there are no profits for distribution. I am firmly convinced that a sensible profit-sharing arrangement, founded on mutual confidence between management and employes, has nothing to fear during bad times, unless possibly the slack period immediately follows the establishment of the plan. In our case we have had only one year, 1921, in which there were no profits to divide. In that year not even a suggestion of trouble arose. The men knew conditions were bad generally; they knew our position and that we were making every effort to improve it. They appreciated our endeavors to keep the plant going so everyone could work. I have not known a year when the morale of our employes was higher."

Benefits Based on Merit

Mr. Baker said that the weekly wage is based upon individual merit and the share in the profits varies with the wage, so the share is, in that degree, according to merit.

"The firm with a profit-sharing plan must take its employes into its confidence so that they know the management is honest and economical. In our plant everyone tries to save money for the firm. I am a mechanical engineer and by assuming the duties of the firm's engineer in addition to my executive duties, we are able to save one salary.

"We have designed our buildings and built them with day labor. Our men run two or more machines each. Even the boiler fireman doubles in our band. In his spare time he operates a small drill press set up beside his boilers.

"One of our chief aims is to offer steady employment all the year. We work a nine-hour day and a six-day week; when slack, instead of laying off the workers we work less time. During the winter, our dull season, we manufacture and store parts to be assembled when the demand exists. We are constantly searching for new markets.

"Much of the success of our plan," summarized Mr. Baker, "may be traced to loyal employes who have been willing to work with management to make our company a prosperous concern. We have learned to pull together. That the result has been profitable is indicated by the fact that since 1899, except for one year, the profit-sharing percentage never has been below 28% and in several years it was more than 100%."

*Reprinted from the "Executives Service Bulletin for Metropolitan Group Insurance Policy Holders," Metropolitan Life Insurance Co., February, 1927.

Promoting Agricultural Limestone in Kentucky

THE annual report of County Agent F. B. Wilson shows that 847 farmers in 82 of the 87 school districts in Laurel county, Kentucky, used limestone last year. They spread an average of 2.19 tons per acre on 45,662 acres.

A feature of the work which did much to make the campaign a success was the fact that dealers agreed to keep limestone available at all times, so that farmers could always buy it in any amount desired. It also was sold on credit. Approximately two-thirds of the total amount used in the county was purchased in sacks.

Practically everyone of the 847 farmers using limestone are satisfied with results, according to Mr. Wilson. Nineteen farmers using acid phosphate and fine limestone in amounts varying from 500 to 1200 lb. per acre secured a sweet clover stand estimated at 800%, while on unlimed land the stand was less than 2%.

Thirteen farmers using limestone reported an average increase in corn yield of 18 bushels per acre. In one instance a boy who applied 1000 lb. of limestone and 400 lb. of phosphate harvested 103 bushels of corn from an acre, while 30 bushels were obtained from an untreated acre of similar land left as a check.

Mr. Wilson observed that 500 to 1000 lb. of finely ground limestone gave as good or better results than a ton or more of coarsely ground stone.

Hints and Helps for Superintendents

Three Large Blasts at Quarries of Colorado Portland Cement Co.

WITHIN the last few months, three successful blasts have been set off at the quarries of the Colorado Portland Cement Co. One of these was at the limestone quarry and the other two at the shale pits. Every shot was carefully planned and excellent pictures of the blasts taken by E. J. Strock, superintendent of the company. A check of the tonnage recovered against that calculated is part of the blasting scheme followed by this company. The accompanying illustrations and data relative to the shooting were furnished by Mr. Strock.

The first shot was made in the shale quarry on October 29. Sixty-seven holes spaced from 12 to 20 ft. apart were put down at different depths and loaded with varying charges. A total of 11,000 lb. of powder was used. The displacement was calculated at 52,000 tons, including the break-back, or about 4.729 tons of shale per pound of powder. This shot was bound in on three sides by material already shot and on the fourth side by undisturbed shale. Under the conditions, the blast was considered excellent and the fragmentation perfect.

The second blast was made in the new limestone quarry on January 7, 1927. Eighty-eight holes, spaced 10 and 14 ft. apart and put down from 36 to 37 ft., were loaded. The entire powder charge totaled 24,480 lb., of which 19,750 lb. was Hercules 40% gelatine and 5600 lb. Hercules "Quarry Special." The estimated recovery of 103,482 tons was exceeded, the actual shovel loading being 105,404 tons, or 4.79 tons of rock per pound of powder used.

The most recent shot, January 25, 1926, was made in the shale quarry. Thirty-five holes were let down, using an Armstrong well drill. The holes were of 6½-in. dia. and of 80-ft. maximum depth. Powder charge consisted of about 19,500 lb. Hercules "Quarry Special" and 2500 lb. Hercules black powder. The shot has not yet been checked for recovery, but it is estimated that about 155,000 tons of shale will be broken.

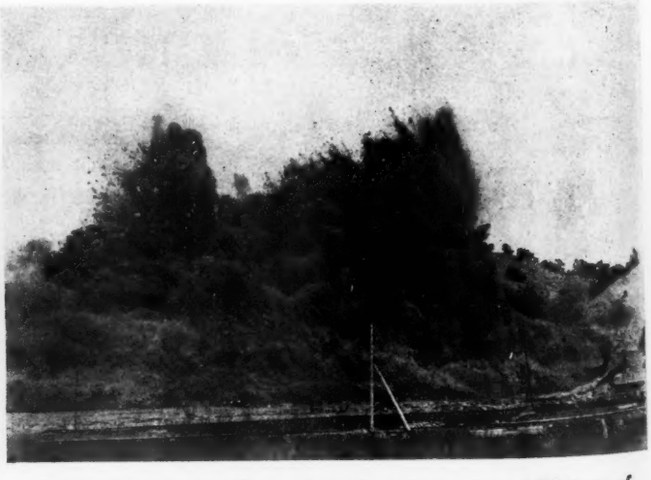
The diagrams on the succeeding page show the spacing, depth and powder loads carried by the individual holes.

Unloading and Spreading Slag Hydraulically

THE Duquesne Slag Products Co. of Pittsburgh, Penn., has been making a slag fill near Pittsburgh along the bank of the Ohio river. It is an interesting application of hydraulic methods for unloading cars and spreading material and it is described in detail in the October 21 issue of *Engineering News-Record*. Three jets were used and the water was pumped to them by two 10-in. centrifugal pumps mounted on a dredge. The nozzles were from 2 to 4 in. dia. and water supplied at 120-lb. pressure.

The most recent blast in the shale quarry

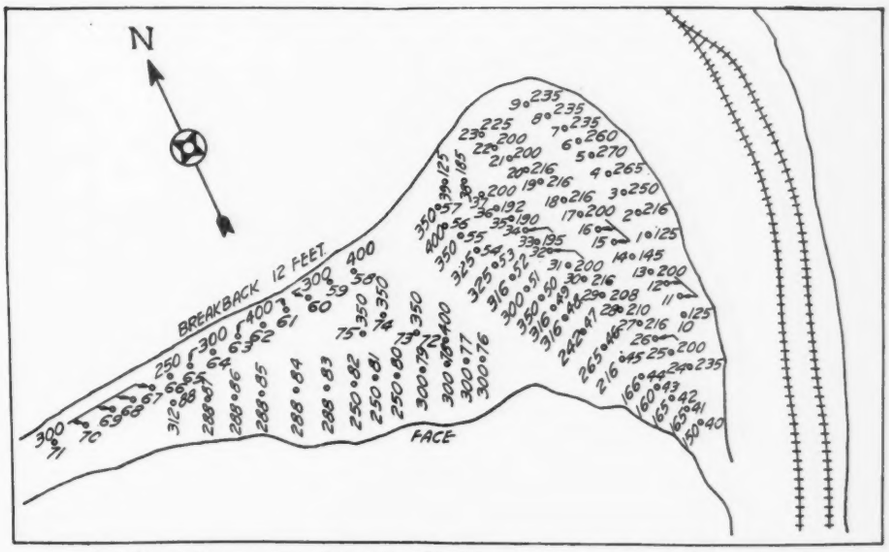
Shale quarry blast. The recovery was 4.729 tons of rock per pound of explosive



Limestone quarry blast. Actual recovery was 4.79 tons of rock per pound of explosive

The slag was brought to the fill in hopper-bottomed cars on a track that was well above the fill. These cars were spotted in turn over a trough called the sluice pan. The slag was rapidly washed out of the cars by a jet of water from a nozzle above the car. As the slag and water fell into the sluice pan they were struck by a second jet which threw the slag out on the fill. Here a third, a "booster," jet caught the falling slag and distributed it.

The slag was filled into a space from 250 to 350 ft. wide, measuring from the track in the manner described, after which the track was moved to the edge of the fill so that the fill could be carried out.



Loading diagram for blast in the limestone quarry of the Colorado Portland Cement Co.

Repairing Crack in Dipper Lip

E. E. DOTTER
Master Mechanic, General Crushed Stone Co., White Haven, Penn.

THE lip or mouthpiece on one of our 2½-yd. shovel dippers developed a crack about 34 in. long. A short crack had been in the lip for some time, but one day while the shovel was operating, we noticed that the crack had lengthened and the lip would spring down about four inches at the crack when digging in a fairly solid bank. It was plainly to be seen that the lip would not last more than a few days. This dipper was equipped with Van Port Rev. D. T. Bases and points Pat. 203 D. V. 3. We repaired the lip by placing another base and point on it, a Van Port Rev. D. T. Base Pat. 202 ZV7, which we happened to have.

The accompanying sketch shows how this extra base was put on the lip, and the approximate location of the crack. At the top of the lip the crack was about nine inches from the center of the next base, and at the bottom about four inches. With an acetylene cutting outfit this lip was repaired in about two hours. With reference to the sketch the dotted lines show portion of lip which was cut out in order to make a recess or notch for the new base to fit into, thus preventing the base from moving sideways.

The crack on the lip occurred on the side toward the face of the quarry, and our shovel operator informed us that stones which ordinarily did not enter the bucket did so now because of the extra base and point. The crack did not become any longer, although the dipper was used daily for the remainder of the season (about two months) and we expect to use it again in the spring. A base of any other type would have answered the purpose equally as well as the one we used. The base we placed over the crack was smaller than the regular bases for this bucket, which of course was unnecessary. We simply used what we had.

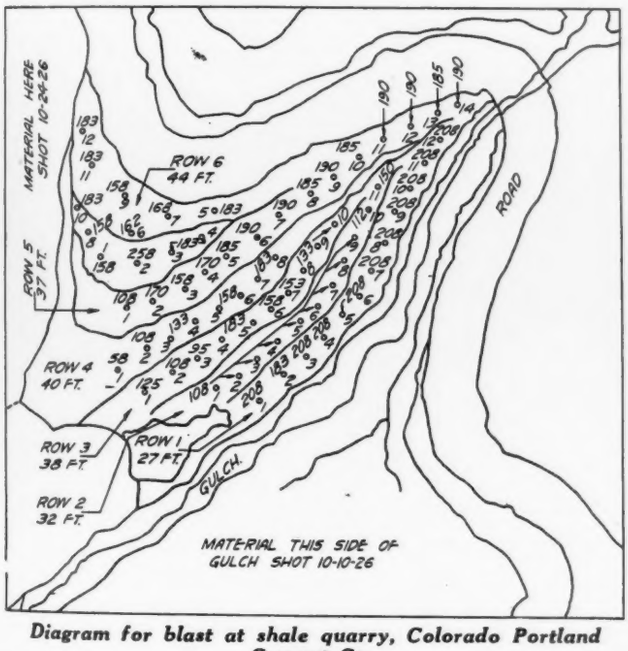
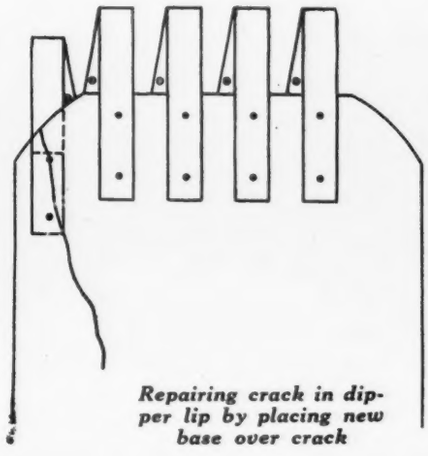


Diagram for blast at shale quarry, Colorado Portland Cement Co.



Repairing crack in dipper lip by placing new base over crack

Water tank mounted on railway car truck

Water Tank for Locomotive Crane

THE cut shows a simple form of water tank mounted on a railway car truck which can be used for a number of purposes. This particular tank is used at the Marble Cliff quarries in Columbus, Ohio, as a tender for a locomotive crane which works on the stock piles of coarse and fine concrete aggregate. It stands on a track that runs through the yard so that the crane may take water from it without moving far. For filling the tank is taken out and returned by one of the steam dinkies that moves cars in the storage yard.

Although this is a regular water tank made for the purpose for which it is used, an old boiler of the right type might be mounted in this way and used for the same purpose.

Carl Leonardt

THE death of Carl Leonardt, president of the Southwestern Portland Cement Co., at Los Angeles, Calif., February 13, was noted in our issue of February 19, p. 75. Since then we have received a portrait and further biographical details of this well-known and well-beloved character. The folling is a tribute to his memory by the *Los Angeles Times* of February 14:

Carl Leonardt, president of the South-

Carl Leonardt

western Portland Cement Co., builder of some of the more prominent older buildings in the city and for forty years a resident of Los Angeles, died in the Good Samaritan Hospital early yesterday morning. He was operated on for an abdominal trouble about two weeks ago. He was 71 years of age.

Mr. Leonardt was a building contractor here for many years. He erected the Hall of Records, Pacific Electric Building, H. W. Hellman Building, Grant Hotel in San Diego, the sugar plants at Oxnard and Huntington Beach, and many public and semi-public structures.

For the last seven or eight years Mr. Leonardt had devoted himself exclusively to his cement interests. His company has plants in Victorville, El Paso, Tex., and Osborn, Ohio.

Westphalia, Germany, is the place of Mr. Leonardt's nativity. He left there forty-one years ago for America. He was at San Antonio, Tex., for a year and then came here. The Leonardt family home was at 2 Chester Place until the death of Mrs. Leonardt three years ago. Since that time he had lived at the home of his daughter, Mrs. Frank Powell, 687 South Oxford Street. The other daughter, Mrs. Felix McGinnis, lives in San Francisco.

A funeral service will be conducted at the Powell home tomorrow at 9 a. m. and will be followed by one in St. Vincent's Church, where Bishop Cantwell will officiate. Burial will be in Calvary Cemetery.

Honorary pallbearers for the funeral include E. L. Doheny, Marco Hellman, Irving H. Hellman, Dr. Carl Kurt, Dan Murphy, Secondo Guasti, Dr. P. G. White, C. J. Kubach, John P. Krempel, Frank Jackson, W. G. Kerckhoff, William Lacy, R. H. Lacy, Victor H. Rosetti, J. A. Graves, E. R. Maier, Simon Maier, John Trainor, Norman Macbeth, Richard Culver, Isadore B. Dockweiler, Joseph Scott, F. R. McNamee, Reese Llewellyn, Louis Schirm, J. A. Riordan, W. E. Keller, Eugene O. McLaughlin, Carl Thompson, H. F. Vollmer, Dr. C. W. Anderson and E. H. McGinnis.

Active pallbearers will be Dwight H. Hart, Charles C. Merrill, George W. Lichtenberger, A. Bayer, C. A. Fellows and Louis Lichtenberger.

Florida Cement Outlook

THE entire production of the Florida Portland Cement Co.'s plant, now under construction at Hookers Point, near Tampa, will, at the present rate of building in Florida, be absorbed within a radius of 75 miles of Tampa, according to the president of the company, John L. Senior, says the *Tampa Tribune*. Mr. Senior is looking forward to the day when the $5,000,000 plant, now being built to have a capacity of 1,500,000 bbl. of cement a year, will be insufficient to meet the demands, the *Tribune* adds. The Florida Portland Cement Co.'s officials have great faith in the future of Florida, and at Hooker's Point are establishing one of the largest plants of its kind in the United States. They hope to sell most of their product in Florida, although they are building a plant of sufficient capacity to take care of a large outside trade.

Duff A. Abrams Resigns

THE Portland Cement Association announces with regret the resignation of Duff A. Abrams, for many years director of the research laboratory. Professor Abrams inaugurated the present-day research in concrete when he took charge of the Structural Materials Research Laboratory in 1916. The research program, then begun, was supported by co-operation of Lewis Institute and Portland Cement Association. This joint arrangement continued until May, 1926, when the research laboratory was installed in the new headquarters building of the Portland Cement Association at 33 West Grand avenue, Chicago.

Professor Abrams' work in concrete research is internationally known. His bulletins and scientific papers have been translated into many languages and are standard reference works in concrete technology.

Prior to his connection with Lewis Institute, Professor Abrams was a member of the faculty staff of the University of Illinois, of which he is a graduate.

F. R. McMillan, manager, Structural and Technical Bureau, Portland Cement Association, has been appointed director of research to have charge of all investigations in cement and concrete for the Portland Cement Association. Mr. McMillan has been a member of the headquarters and laboratory staffs since April, 1924. Prior to that time, for three years he was associate structural engineer with Adolph F. Myer, consulting hydraulic engineer of Minneapolis. He was also on the staff of the Turner Construction Co. for some time and was in charge of concrete ship design for the Emergency Fleet Corp., United States Shipping Board, during and subsequent to the war. For nine years Mr. McMillan was on the faculty staff of the University of Minnesota in charge of concrete design

Duff A. Abrams

in the concrete laboratory. He is a graduate of the University of Minnesota.

H. F. Gonnerman, associate engineer, research laboratory, Portland Cement Association, has been appointed director of the laboratory. Professor Gonnerman joined the staff of the laboratory in 1922. Prior to that time he was in a private business in the far west and from 1908 to 1920 was on the faculty staff at the University of Illinois, of which he is a graduate. Professor Gonnerman is joint author of many of the research laboratory bulletins and while on the faculty staff at the university wrote a number of technical and scientific papers which received wide attention in engineering and technical circles. For many years he has been active in the American Society for Testing Materials and other technical and engineering societies.

New Source of Trap Rock for Great Lakes Cities

Canadian Plant at Fort William, Ontario, to Begin Shipments May 1

THE following data in regard to a new crushed-stone operation—the Quinn Stone and Ore Co., Ltd., Fort William, Ont., with sales offices at Duluth and Cleveland—has been received from L. E. Ives, sales manager of the company, Union Trust Bldg., Cleveland, Ohio:

"Our quarry and plant at Fort William, Ont., will ship, beginning May 1, all grades and sizes of Lake Superior trap rock, thoroughly washed, cleaned and prepared, for practically any use desired.

"We are prepared to deliver this rock in any tonnage desired, at any lake port, in either the usual type of lake bulk freighter for unloading at docks where suitable equipment is provided for that purpose, or in self-unloader boats at docks where there is no unloading equipment capable of giving good vessel dispatch.

"The plant itself contains a machine unusual for a plant of this character. This is a Davis-Dorr rake-type classifier, a machine rather widely used in the metallurgical and other fields and which will result in our being able to deliver carefully classified product ranging in size from 3 in. down, as desired. Ample storage facilities are provided at the plant at Fort William, and these together with suitable storage facilities at various lower lake ports will enable us to deliver tonnages of such sizes as are wanted on practically immediate notice."

A descriptive booklet prepared by Clement & Quinn and Co., agents for the Quinn Stone and Ore Co., Ltd., gives the following data on "Lake Superior Trap Rock":

Location

"The quarry from which this trap rock is produced is located on the Kaministiquia river at Fort William, Ont. This port is located on Thunder Bay on the north shore of Lake Superior, at which point is a rock crushing, washing and screening plant of the most modern construction. On this same river are situated many of the paper mills and elevators at Fort William and therefore proper draft for the largest lake vessels is maintained by the Canadian government.

Transportation

"From this plant material can be delivered either into railroad cars or trucks from bins; or into vessels for shipment down the lakes. In other words, we are equipped to deliver this rock in any tonnage for shipment via rail or trucks or by our own or other lake type or self-unloader boats. Delivery can be made f.o.b. boats at our dock at Fort William or f.o.b. boat or dock at other ports on the Great Lakes, including those on Lake Erie and the lower end of Lake Michigan. Loading rate for boats at Fort William is about 800 tons per hour. Full cargoes of any one grade can be loaded or combination cargoes consisting of varying tonnages of different grades, separated from one another by bulkheads in the boat, can also be prepared.

Plant Capacity

"The capacity of the plant is 250 tons per hour, equivalent to 5000 tons per day working two shifts, which, assuming 150 working days during the season, is equivalent to an annual production of 700,000 tons.

Sizes

"The size of material that can be delivered ranges from the largest to the smallest, and the tonnage desired can be confined to any one size or can be made up of any proportion of such sizes as are wanted. Further, the rock is all thoroughly washed and cleaned, containing no foreign matter, clay, loam, etc. The larger sizes are especially suitable for rip rap, railroad ballast and heavy construction work, also they make the best possible coarse aggregate for all forms of concrete. The finer sizes, because of their sharp, gritty, angular form, are particularly adapted to use in fine concrete aggregate where high quality is especially required. This should be of particular interest to manufacturers of paving blocks, concrete, pipe, etc. The unusually fine sizes can be made to meet any specifications for special paving work, concrete posts, poles and other concrete products. Unusually large sizes also can be prepared, where exactness and quality of material are specially important. The specially sized and cleaned larger material is particularly well suited for filtration work and also for paving between street car tracks in municipal work as well as along the outer edges of such tracks. There is available also perfectly cleaned and sized rock chips, which are greatly desired for certain kinds of concrete work as well as for use in the manufacture of prepared roofing and shingles.

Quality of Rock

"An average of numerous tests conducted by the Pittsburgh Testing Laboratory, also the laboratories of the Michigan State Highway Commission and the Minnesota State Highway Commission, is given below.

"As a result of such tests this trap rock has been recommended for use on state highways by both the Minnesota and Michigan State Highway Commissions.

"It should be of particular interest to manufacturers of prepared roofing and shingles to know that this rock will not discolor with age."

TEST ON LAKE SUPERIOR TRAP ROCK

French co-efficient	Hardness	Toughness	Wear	Absorption	Weight per cu. ft.	Specific gravity
17.10	17.40	27.50	2.3	.70	165	2.65

New Oregon Lime Plant

LIME PRODUCTS, INC., of Portland, Ore., a company organized to develop the lime business at Orofino, Idaho, and which has been putting up a kiln, buildings and installing machinery for the past several weeks under the direction of C. W. Mathews, manager, started production the first week in February.

The site of the plant is a half mile above the tunnel on the Clearwater branch of the Northern Pacific railway, a mile and a half from Orofino. The new company took over the improvements left by Mr. Zumwalt, built two years ago and consisting of a sidetrack, bins for holding chicken grit, fertilizer and pebble dash, and some machinery for crushing. Since beginning operations several weeks ago upwards of $8,000 in additional improvements has been put in. These consist of a concrete lime kiln, a cooling shed, a cooperage room and general overhaul of machinery. Mr. Mathews is greatly pleased with the number of orders received and with the general interest the plant is attracting and the high quality of the products which have been turned out. A sample kiln of some eight tons of limestone was burned a couple of weeks ago and samples sent to Portland and tested showed it to be properly burned and in purity the equal of any lime on the market.

Mr. Mathews has shipped out six cars of rock to paper mills, where it has been tried and found excellent for its purpose. He has orders for 15 cars of chicken grit and four or five of fertilizer or agricultural limestone.

Five products are sorted by one revolving screen of different meshes, so that the dust goes through to the bin for fertilizer, three sizes of chicken grit go to other bins, and the proper size pebble dash goes to a fifth. This process will turn out 40 tons a day when operating full blast.

These products are shipped out in sacks which bear the name "Oro" brand lime products. All the products of the company from Orofino will be handled under that trade name.

If the business warrants, two more kilns similar to this one will be built.—*Orofino* (Idaho) *Tribune.*

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Allentown Portland Cement Co. (common)[32]	Feb. 26	.....	2	4	
Allentown Portland Cement Co. (6% bonds, 1932)[32]	Feb. 26	.....	85	.....	
Alpha Portland Cement Co. (common)[2] new stock	Mar. 2	No par	38	38	75c Jan. 15
Alpha Portland Cement Co. (preferred)[2]	Feb. 28	100	115	.....	1¾% quar. Mar. 1
American Lime and Stone Co. (7% bonds, 1942)[32]	Feb. 26	.....	98	101	
Arundel Corporation (sand and gravel—new stock)	Mar. 2	No par	33¼	34	45c qu., 20c ex. Jan. 3
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	Mar. 1	.....	110	114	
Atlas Portland Cement Co. (common)[2]	Feb. 28	No par	41	43	50c qu. Dec. 1, $1 ex. Jan. 12
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% quar. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	Feb. 28	33⅓	43	43	2% quar. Jan. 3
Beaver Portland Cement Co. (1st Mort. 7's)[8]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (Class A)[4]	Feb. 25	.....	32	32½	
Bessemer Limestone and Cement Co. (6% bonds)[4]	Feb. 25	.....	99	100	
Boston Sand and Gravel Co. (common)	Feb. 26	100	73	75	1% qu., 2% ex. Jan. 1
Boston Sand and Gravel Co. (preferred)	Feb. 26	.....	.....	85	1¾% quar. Jan. 1
Boston Sand and Gravel Co. (1st preferred)	Feb. 26	.....	.....	90	2% quar. Jan. 1
Canada Cement Co., Ltd. (common)	Mar. 2	100	132	134	2% Jan. 4
Canada Cement Co., Ltd. (preferred)[11]	Feb. 26	100	119	120	1¾% quar. Feb. 16
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	Feb. 26	.....	101	102½	3% semi-annual A&O
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	Feb. 26	100	93	96	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Feb. 28	No par	22½	25	75c Jan. 12
Charles Warner Co. (preferred)	Feb. 28	100	100	104	1¾% quar. Jan. 27
Charles Warner Co. (lime, crushed stone, sand and gravel) 7s, 1929[16]	Feb. 26	100	102	103½	
Cleveland Stone Co. (new stock)	Mar. 1	.....	52	52	50c qu.; 25c ex. Mar. 15
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	Feb. 26	100	104	.....	
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Mar. 1	100	97	99	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Mar. 1	100	96	100	
Consumers Rock and Gravel Co. (1st Mort. 7s)[13]	Feb. 24	100	100	102	
Coosa Portland Cement Co. (6% bonds, 1941)[32]	Feb. 26	.....	65	.....	
Coplay Portland Cement Co. (6% bonds, 1944)[32]	Feb. 26	.....	89	.....	
Dewey Portland Cement Co. (1st mort. 6's 1942)[30]	Mar. 1	100	98½	100	
Dolese and Shepard Co. (crushed stone)[7]	Mar. 2	50	98	101	$1.50 Jan. 1, $1.50 ex. Jan. 1
Egyptian Portland Cement Co. 7% pfd.[21]	Feb. 28	.....	90	100	1¾% quar. Oct. 1
Egyptian Portland Cement Co. (common)[21]	Feb. 28	.....	8	9½	40c quar. Oct. 1
Fredonia Portland Cement Co.[32]	Feb. 26	.....	98	101	
Giant Portland Cement Co. (common)[2]	Mar. 2	50	63	63	
Giant Portland Cement Co. (preferred)[25]	Feb. 28	50	40	47	3½% and 19% ex. Dec. 15
Ideal Cement Co. (common)	Mar. 2	No par	80	83	$1 quar., $1 ex. Dec. 15
Ideal Cement Co. (preferred)[33]	Feb. 28	100	110½	111½	1¾% quar. Dec. 15
International Cement Corporation (common)	Mar. 2	No par	51⅝	51⅞	$1 quar. Mar. 31
International Cement Corporation (preferred)[2]	Feb. 28	100	106⅜	106⅜	1¾% quar. Mar. 31
Kelley Island Lime and Transport Co.	Mar. 1	100	129	135	$2 quar., $2 ex. Jan. 2
Lawrence Portland Cement Co.[3]	Feb. 26	100	98	102	2% quar.
Lehigh Portland Cement Co.[6]	Feb. 28	50	93	97	1½% quar.
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1927 to 1931)[12]	Dec. 18	100	98	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1931 to 1935)[12]	Dec. 18	100	97	98½	
Marblehead Lime Co. (1st Mort. 7's)[14]	Feb. 25	100	100	.....	
Marblehead Lime Co. (5½% notes)[14]	Feb. 25	100	98	100	
Michigan Limestone and Chemical Co. (common)[6]	Feb. 28	.....	26	28	
Michigan Limestone and Chemical Co. (preferred)[6]	Feb. 28	.....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Mar. 2	25	49½	50	50c Feb. 1
Monolith Portland Cement Co. (common)[9]	Feb. 24	.....	12½	12¾	8% ann. Jan. 2
Monolith Portland Cement Co. (units)[9]	Feb. 24	.....	31¾	32¼	
Monolith Portland Cement Co. (preferred)[9]	Feb. 24	.....	9½	9¾	
Nazareth Cement Co.[29]	Feb. 26	No par	29	33	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	Feb. 26	.....	111	115	
Newaygo Portland Cement Co. (6½% bonds, 1938)[32]	Feb. 26	.....	99	102	
New England Lime Co. (Series A, preferred)[14]	Feb. 25	100	.....	95	
New England Lime Co. (Series B, preferred)[23]	Feb. 14	100	94	.....	
New England Lime Co. (V.T.C.)[23]	Feb. 14	.....	33	36	
New England Lime Co. (6s, 1935)[14]	Feb. 25	100	99	101	
New York Trap Rock Corp. (6% bonds, 1946)[32]	Feb. 26	.....	95	100	
North American Cement Corp. 6½s 1940 (with warrants)	Mar. 2	100	91¼	91¼	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	Feb. 26	.....	70	80	2 mo. period at rate of 7%
North American Cement Corp. (common)[19]	Nov. 8	.....	20	22	
North American Cement Corp. (preferred)	Jan. 28	.....	.....	.....	1.75 quar. Feb. 1
North Shore Material Co. (1st Mort. 6's)[15]	Mar. 1	100	98½	100	
Pacific Portland Cement Co., Consolidated[5]	Feb. 24	100	71	74	25c mo.
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[5]	Feb. 24	100	97½	.....	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	Feb. 26	10	4⅞	5¼	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[29]	Mar. 2	100	100	100½	
Pennsylvania-Dixie Cement Corp. (preferred)[29]	Mar. 2	100	99	99	1¾% March 15
Pennsylvania-Dixie Cement Corp. (common)[29]	Mar. 1	.....	35	36¼	80c April 1
Petoskey Portland Cement Co.[1]	Mar. 2	10	9½	10	1½% quar.
Pittsfield Lime and Stone Co.[31]	Feb. 14	.....	.....	100	
Pittsfield Lime and Stone Co.[31] (common)	Feb. 14	.....	.....	25	
Rockland and Rockport Lime Corp. (1st preferred)[10]	Feb. 26	100	103	.....	3½% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (2nd preferred)[10]	Feb. 26	100	60	.....	3% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (common)[10]	Feb. 26	No par	50	.....	1½% quar. Nov. 2

(CONTINUED ON PAGE 68)

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee, Higginson & Co., Boston and Chicago. [11]Nesbitt, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson Jr. Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]William C. Simons, Inc., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [30]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass.

Editorial Comment

Portland Cement Gets New Recognition

After hammering away for several years on the economic and engineering importance of the portland cement industry it is gratifying to see a growing appreciation of it, and all its accessory industries, by mining engineers; for an editor of ROCK PRODUCTS recalls reading a paper on "Opportunities for Mining Engineers in the Rock Products Industry" at the annual meeting of the American Institute of Mining and Metallurgical Engineers two or three years ago. At the time there was very little apparent interest in the subject, and after one or more attempts (the most recent last year) to organize a program on non-metallics at the annual meetings of the Institute, the opportunity to interest mining engineers in the subject seems to have been sadly neglected. It is therefore with considerable satisfaction we note the following editorial in *Engineering and Mining Journal:*

PORTLAND CEMENT

One of the most important structural materials is portland cement. About 170,000,000 bbl. was produced in the United States in 1926. As the *Engineering News-Record* states, it is impossible to tell just where all of this cement went, or even to do more than to guess, more or less intelligently, as to the proportion of the various uses. Viewed from the mining angle, this 32,000,000 tons of cement means the quarrying of limestone and shale and the use of slag to the amount of close to 50,000,000 tons. Some 12,400 tons of explosive was required for the excavation of the material. In addition, fuel equivalent to the approximate amount of 14,000,000 tons of coal was required for furnacing the clinker. The industry thus derives the equivalent of 64,000,000 tons from mines and quarries. About $500,000,000 is invested in the business, which employs 60,000, with an estimated payroll of $100,000,000 per annum.

As most of the cement manufactured is used for concrete, the sand and crushed rock necessary for aggregates involves an additional amount of excavation and quarrying several times that required for the manufacture of the cement.

The industry, huge in a quantitative sense, is a part of the nonmetallic mining industry. It ranks next to the petroleum industry in financial importance. Almost everyone's life touches the mining industry at several points; the office building in which we work and the home where we live have many reminders of the miner and his activities. One is apt to restrict his conception of mining to metals and coal, but although these are important enough, the industry includes many other materials, especially those used in building construction and in raw products for the chemical and metallurgical industries.

Cement is more and more becoming the almost universal structural material. Roads, pavements, dams, retaining walls, bridges and buildings are dependent upon this material. The industry presents many real opportunities for the mining engineer and the technologist.

Incidentally, it might be added that mining engineers, who, one naturally thinks, would be very much interested in these industries, are about the last of professional or industrial groups to sit up and take notice. There are of course many reasons, the principal one being that the rock products industries have learned to subsist and even prosper to a very considerable extent without the help or employment of professional mining engineers, except to an almost imperceptible degree. It is indeed quite true that there is much similarity in some of the technical problems of metallic mining and metallurgy and of quarrying and cement manufacture; in all other respects, however, the industries are very far apart and probably always will be. We realize that much better now than we did when the previously mentioned paper was read before the American Institute of Mining and Metallurgical Engineers. We see a greater possibility of the Institute and the mining profession getting some new members by recognizing technical men in the rock products industries as "mining engineers" or "metallurgists," than of present members of the mining engineering profession ever becoming numerous or important factors in these industries.

Personnel and Efficiency

Prices are declining in nearly all building material lines. Production facilities are increasing. Competition is becoming keener. Importations of competitive materials from abroad are becoming more and more a factor to be considered. If profits in these building material producing industries are to continue, costs as well as prices must be reduced.

While at many individual plants there is certainly much room for greater mechanical efficiency through power saving, more modern methods and equipment, etc., generally considered these industries do not offer any prospect of radical changes or improvements which will appreciably affect the lowering of costs.

It seems to have been pretty well demonstrated that relatively high wages and shorter working days have resulted in remarkable increases in labor efficiency during the past two or three years at many industrial plants. This greater efficiency has come about through a better understanding on the part of employes of the necessity for greater efficiency in exchange for high wages and better working conditions. Profit-sharing, accident prevention, welfare work, etc., if properly conducted, all help bring about this understanding.

Such personnel problems are becoming daily of more importance because it is obvious that this country cannot continue on so much higher an economic plane than the rest of the world, unless we continue to lead also in efficiency of production. Business managers may study, investigate—know the way and lead—but it is the laboring man in the plant who must deliver, and upon whom, in a large measure, rests the primary responsibility for maintaining present wage levels.

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS (Continued)

Stock	Date	Par	Price Bid	Price Asked	Dividend Rate
Sandusky Cement Co. (common)[1]	Mar. 1	100	125	126	$2 qu., $4 ex. Jan. 1
Santa Cruz Portland Cement Co. (bonds)[5]	Feb. 24	.....	107	110	6% annual
Santa Cruz Portland Cement Co. (common)[5]	Feb. 24	.....	83	.....	$1 quar., $1 ex. Jan. 1
Schumacher Wallboard Corp. (common)	Feb. 11	.....	23¾	24	
Schumacher Wallboard Corp. (preferred)	Feb. 11	.....	27¾	.....	
Superior Portland Cement, Inc. (Class A)[20]	Feb. 24	.....	44	44½	
Superior Portland Cement, Inc. (Class B)[20]	Feb. 24	.....	21½	22½	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	Feb. 26	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	Feb. 26	100	98	100	
United States Gypsum Co. (common)	Mar. 2	20	95½	97	40c quar. March 31
United States Gypsum Co. (preferred)	Mar. 2	100	117	120	1¾% quar. March 31
Universal Gypsum Co. (common)[3]	Mar. 2	No par	6⅛	6⅜	
Universal Gypsum V.T.C.[3]	Mar. 1	No par	5½	6	
Universal Gypsum Co. (preferred)[3]	Nov. 23	.....	73	77	1½% Feb. 15
Universal Gypsum and Lime Co. (1st 6's, 1946)[3]	Mar. 1	100	.....	96	
Union Rock Co. (7% serial gold bonds)[18]	Feb. 24	100	99	101	
Upper Hudson Stone Co. (1st 6's, 1951)[22]	Feb. 26	.....	94	.....	
Upper Hudson Stone Co. (1st 6's, 1937)[22]	Feb. 26	.....	94	.....	
Vulcanite Portland Cement Co. (7½% bonds, 1943)[22]	Feb. 26	.....	105	.....	
Wisconsin Lime and Cement Co. (1st Mort. 6s, 1940)[15]	Mar. 1	100	98½	100	
Wolverine Portland Cement Co.	Mar. 2	10	5¼	5¼	1½% Feb. 15

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend rate
Atlanta Shope Brick and Tile Co.[1]	Nov. 24	.....	25c	.....	
Benedict Stone Corp. (cast-stone) (50 sh. pfd. and 390 sh. com.)[1]	Dec. 29	.....	$400 for the lot	.....	
Coplay Cement Mfg. Co. (common) (4)	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred) (1)	Dec. 30	.....	70	.....	
Eastern Brick Corp. 7% cu. pfd.) (1)	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common) (1)	Dec. 9	10	40c	.....	
Edison Portland Cement Co. (common)[4]	Sept. 11	50	20c	.....	
Edison Portland Cement Co. (preferred)	Nov. 3	50	17½c(x)	.....	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Globe Phospate Co. ($10,000 1st mtg. bonds, $169.80 per $1000 paid on prin.)	Dec. 22	.....	$50 for the lot	.....	
Iroquois Sand & Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.) (2)	Mar. 17	.....	$12 for the lot	.....	
Limestone Products Corp. (150 sh. pfd., $50 par, and 150 sh. com., no par)	Dec. 22	.....	$60 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼% semi-annual
Olympic Portland Cement Co. (g)	Oct. 13	.....	.....	£1⅜	
Phosphate Mining Co. (1)	Nov. 24	.....	1	.....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.) (1)	June 23	.....	$200 for the lot		
Rockport Granite Co. (1st 6's, 1934)[2]	Aug. 31	.....	90	.....	
Simbroco Stone Co. (pfd.)	Dec. 12	.....	.....	.....	$2 Jan. 1
Southern Phosphate Corp.[6]	Sept. 15	.....	1¼	.....	
Tidewater Portland Cement Co. (3000 sh. com.)	Dec. 22	.....	$6525 for the lot	.....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd. (6)	Nov. 3	.....	$1 for the lot	.....	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick) (5)	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. (1) Price obtained at auction by Adrian H. Muller & Sons, New York. (2) Price obtained at auction by R. L. Day and Co., Boston. (3) Price obtained at auction by Weilepp-Bruton and Co., Baltimore. Md. (4) Price obtained at auction by Barnes and Lofland, Philadelphia, Pa. (5) Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. (6) Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

Ross Island Sand and Gravel Co. Bonds Offered

RALPH SCHNEELOCH CO., Portland, Ore., are offering at a price of 100 to yield 7%, $550,000, 7% first closed mortgage and collaterally secured gold bonds of the Ross Island Sand and Gravel Co., Portland, Ore. Dated January 1, 1927. Due January, 1, 1927. Issued in $100, $500 and $1000 denominations. Redeemable at 30 days' notice at 103 and accrued interest.

The following data are taken from a letter addressed to the underwriters by D. L. Carpenter, president of the company:

Business. The Ross Island Sand and Gravel Co. is an Oregon corporation engaged in the production, manufacture, distribution and sale of commercial sand and gravel from its valuable deposits of the Ross Island, Hardtack Island, and Toe Island properties located in the Willamette river between the new Ross Island and Sellwood bridges within the corporate limits of the city of Portland, and owned in fee by this corporation; and through majority ownership of its subsidiary, the Beaver Portland Cement Co., with its immense deposit of high grade lime rock at Marble Mountain, in Josephine county, near Grants Pass, Oregon, this corporation is engaged in the manufacture and sale of portland cement to the wholesale and retail trade. Through complete ownership of the Oregon Gravel Co. at Salem, Ore., and its valuable deposits there, the Ross Island Sand and Gravel Co. is also equipped to fill the needs of that Willamette territory for sand, gravel and cement.

Properties and Assets. The total tangible assets of the Ross Island Sand and Gravel Co., as established by book value of investments in subsidiary companies, and by appraisal of properties by the General Appraisal Co., amount to $3,403,054.46. The attached financial statement of the company, which includes gravel deposits both in Portland and in Salem at one-half the value as appraised by the General Appraisal Co., shows net tangible assets applicable to this isssue of bonds of $2,786,864.46, or more than $5000 for each $1000 par value of this issue. These bonds are followed and supported by a preferred and common stock equity amounting to $2,236,854.46 as of December 24, 1926. The Ross Island Sand and Gravel Co. owns 100% of the prior preferred stock, 50.75% of the preferred stock and 55.18% of the common stock of the Beaver Portland Cement Co., which, upon completion of improvements now being made, will be the largest single producer of cement in Oregon, with a daily capacity of 1500 bbl. of portland cement. The total net assets of the Beaver Portland Co. amount to $1,551,473.93, of which $913,519.58 is the proportion applicable to the stock ownership held by Ross Island Sand and Gravel Co.

The Ross Island Sand and Gravel Co., through complete ownership of the Oregon Gravel Co., owns and operates valuable properties and gravel deposits in Salem, Ore. This company, with total net assets as determined by an appraisal of its properties by the General Appraisal Co. amounting to $277,102.29, has for a number of years conducted a successful sand, gravel and building material business in the Willamette valley territory.

The Ross Island Sand and Gravel Co. owns in fee Ross Island, Hardtack Island, Toe Island and adjacent sand and gravel deposits, all containing in excess of 400 acres within the city limits of Portland, and located in the Willamette river between the new Ross Island and Sellwood bridges. Ross Island proper, containing approximately 157 acres, will not be used for the production of sand or gravel, and will be available for sale for industrial sites or other purposes. Proceeds from such sale to be used one-half for retirement of bonds and one-half for retirement of preferred stock. The remaining acres have been thoroughly drilled and studied by a competent corps of engineers headed by W. G. Brown, consulting engineer, whose reports definitely show a proven deposit with a minimum of 13,670,000 cu. yd. of gravel, and 6,000,000 cu. yd. of sand, or a total of over 19,500,000 cu. yd. of commercial sand and gravel.

Without giving consideration to merchandising profits, or any value to 157 acres of main Ross Island property, a figure of 10 cents per cu. yd. for the gravel alone, which is the amount of royalty now being paid by other gravel producers to the state of Oregon, shows a royalty value of the gravel deposit in excess of $1,300,000. The valuation of this group of islands and gravel deposits as established by the General Ap-

praisal Co. is $1,774,840, or over three times the amount of this issue of bonds.

Plant and Distribution. After an exhaustive study of modern sand and gravel plants in the United States by engineers of this company, it has constructed on the west side of Hardtack Island the most modern and efficient plant that could be built. This plant is fed with raw material from the company's deposits by a modern hydraulic dredge with demonstrated capacity of 150 cu. yd. per hour, which is approximately three times the capacity of the clamshell type dredge in use by other producers on the Willamette river. This dredge and plant requires only six men to operate, and has a capacity of 1200 cu. yd. each eight-hour shift, at a production cost of less than 40% of that of the lowest cost of other gravel producers on the Willamette river, whose operations are subject to a royalty of 10 cents per yard to the state of Oregon, and the higher costs attending less modern and efficient plants.

In addition to its plant, where wholesale deliveries will be made, the company has distributing bunkers at the following places in Portland:

1. East Eighth and Boise streets, with rail connection, which will be supplied from the plant by aerial tramway at a transportation cost from plant to bunker of less than one-third that of delivery by scows.

2. The American dock, with rail connections, at foot of Porter street on the west side of the Willamette river just north of Ross Island bridge.

3. Montgomery dock, in Albina (formerly Collins Concrete Pipe Co. bunkers), located at foot of Randolph street.

4. Through contract with the Pacific Bridge Co. to furnish all their sand and gravel for a period of years, the bunkers of that company at foot of East Salmon street will be available for the Ross Island Co.'s deliveries.

Through these strategically located distributing plants as shown on an accompanying map, the Ross Island Sand and Gravel Co. will be able to deliver sand, gravel and cement to any part of the city at the lowest possible cost.

The entire deposit and plant and equipment have been thoroughly examined and studied by J. B. C. Lockwood of Seattle, Wash., an expert dredging and plant engineer of long experience, and a nationally recognized authority. His report confirms the yardage of material as estimated by our engineers, and approves the character and adaptability of the plant and equipment constructed by the company.

Security. These bonds will be a direct obligation of the Ross Island Sand and Gravel Co., and supported by all of its net assets, amounting to over $2,786,854.46, or more than five and one-half times the amount of this issue, and will be specifically secured by first closed mortgage on Ross Island properties and adjacent sand and gravel deposits owned by the company; its plant and equipment just completed at a cost in excess of $300,000; and by pledge of Beaver Portland Cement Co. stock and Oregon Gravel Co. stock with a book value of $1,123,075.19, giving a total value of mortgaged property amounting to $2,639,200.02, or more than four and one-half times this issue of bonds.

Earnings. Based on the past four years' earnings record of the Beaver Portland Cement Co. and the Oregon Gravel Co., the amount of net income of these two companies applicable to the ownership of the Ross Island Sand and Gravel Co. in each amounts to $67,000 per year. This amount should be materially increased in 1927 due to the increased capacity of the Beaver Portland Cement Co., which, upon completion of improvements now being made, will be the largest single producing plant in Oregon. Approximately one-third of this company's entire production of cement for 1927 is now sold under signed contracts. The earnings from booming rights along the shore line of the Ross Island Co.'s properties in the Willamette river will be $12,000 per year. These established earnings alone amount to more than twice interest charges on this issue without giving effect to any earnings from operation of the Ross Island plant.

It is estimated that the Ross Island Sand and Gravel Co.'s production for the year 1927 will be a minimum of 500,000 cu. yd. of sand and gravel. Based on actual sales to users, and upon quantities used in 1926 by contractors and distributors who have signed contracts with this company for their entire requirements for 1927, more than one-half of the estimated production of 500,000 cu. yd. is now sold. Based upon this production, and using the exceptionally low retail prices which have existed in Portland for several months, the Ross Island Sand and Gravel Co.'s net earnings from the operation of its Ross Island plant in 1927 will exceed $129,000, giving total net earnings from all sources of $208,000, or more than five times maximum interest requirements on this issue of bonds and more than three times interest and sinking fund requirements combined.

Sinking Fund. The company will be required to pay to the trustee for a sinking fund a minimum of .05c per cu. yd. of sand and/or gravel produced from its deposits, such sinking fund to be used to purchase bonds in the market up to or to call bonds by lot at 103 and accrued interest.

Purpose of Issue. To provide in part funds for acquiring and developing Ross Island, Hardtack Island, Toe Island and adjacent sand and gravel properties, for the construction of sand and gravel producing and distributing plants and to provide working capital.

Dividends on Common Stock. Annual dividends on the company's common stock will be limited to a maximum of $2.50 per share until all bonds of this issue are retired, and a maximum of $5 per share until all of the preferred stock is retired.

Insurance. The plant and equipment covered by this mortgage will be insured in standard companies to the full insurable value and policies deposited with the trustee. The company also carries appropriate and necessary liability insurance.

Legality. All titles to the company's property pledged have been approved by Messrs. Bowerman and Kavanaugh, attorneys-at-law, Portland, Ore. The fee title to its real property specifically pledged under the trust deed to secure this issue of bonds has been insured to the amount of $750,000 through title insurance policy issued by the Title and Trust Co., Portland, Ore. All legal matters incident to this issue of bonds have been approved by Messrs. McCamant and Thompson, attorneys, of Portland, Ore.

FINANCIAL STATEMENT OF ROSS ISLAND SAND AND GRAVEL CO.

(As Certified by Haskins & Sells, as of December 24, 1926, But After Giving Effect to This Financing.

ASSETS

Cash and due from bankers	$ 145,031.99
Investments:	
Beaver Portland Cement Co. capital stock:	
Prior preferred 7%, 1500 shares $100 each	150,000.00
Preferred, 7% 1520.70 shares $100 each	152,070.00
Common, 2759 shares $100 each—55.18% of entire authorized issue—(book value November 30, 1926)	611,449.58
Oregon Gravel Co. capital stock—entire authorized issued, 500 shares of $100 each (book value November 30, 1926)	209,555.61
Others—cost or nominal value	5,001.00
Total investments	$1,128,076.19
Accounts receivable—intercompany	17,621.45
Fixed Assets:	
Industrial property and gravel deposits (valuation established by General Appraisal Co., Portland Ore., $1,774,840)	1,178,640.00
Plant, bunkers, machinery and equipment	337,484.83
Total	$2,806,854.46

LIABILITIES

First closed mortgage 7% gold bonds due January 1, 1937 (this issue)	550,000.00
Contract indebtedness (payable in sand and gravel @ $1.00 per yard over a period of years)	20,000.00
Capital Stock:	
Preferred 7% cumulative—authorized 7500 shares $100 each, outstanding 5758.7 shares	575,870.00
Common—authorized 30,000 shares without nominal or par value—outstanding 28,497 shares	1,660,984.46
Total capital stock	$2,236,854.46
Total	$2,806,854.46

Rockland and Rockport Lime Corporation Annual Report

THE Rockland and Rockport Lime Corp. reports for year ended December 31, 1926, net earnings, after bond interest, federal taxes and depreciation, of $136,767. After first and second preferred dividends there was a balance of $39,939 available for the 7813 shares of $100 par common outstanding, or $5.11 a share. This compares with earnings in the 1925 calendar year, after first and second preferred dividends, of 67 cents a share on the common.

Consolidated income account for years ended December 31 follows:

CONSOLIDATED INCOME ACCOUNT, 1923-26, INCLUSIVE, ROCKLAND AND ROCKPORT LIME CORP.

	1926	1925	1924	1923
Gross earnings	$1,635,786	$1,814,124	$2,151,544	$2,360,967
Operating expenses	1,424,372	1,582,872	1,758,518	2,020,332
Net profit	211,415	231,253	393,026	340,635
Other income	24,354	14,811	87,126	77,461
Total income	235,769	246,063	480,152	418,096
Depreciation and other charges	99,002	124,463	174,358	118,432
Interest, etc.			67,187	44,310
Balance for dividends	136,767	121,600	237,977	255,354
Dividends paid	96,827	163,593	171,267	73,461
Surplus for year	39,939	*41,993	66,710	181,893

*Deficit.

—*Boston News Bureau.*

Alpha Portland Income Account

GROSS sales of the Alpha Portland Cement Co. for 1926, totaling $17,250,792, were considerably off from the 1925 volume, when, as in 1924 and 1923, total business exceeded $20,000,000. At the same time net income for the year was sharply reduced, being but $2,603,498, compared with $3,858,246 in 1925, $3,085,251 in 1924, and $3,028,399 in 1923. Net for 1926 was equivalent to $4.16 a share on the 592,500 shares of no par common stock which are outstanding, after allowance for dividends on $2,000,000 of 7% preferred.

Decline for the year both in gross sales and net income is attributable to a falling off of some 13% in the sales tonnage, together with a general lowering of prices in various parts of the company's territory. Increased productive capacity in the industry as a whole, brought about by the opening up of several new plants, as well as the increase in facilities of a number of the older companies, resulted in increased competition for sales, bringing about lower prices and consequent lessened net earnings. The effects of foreign competition were also felt to some extent during the year.

Comparison of the company's income account for the years from 1923 through 1926 follows. Earnings a share on the common stock are shown in all years on the basis of the 592,500 shares of no par common now outstanding, in order to afford a more accurate comparison. All increases in the amount of common stock outstanding during the last few years have come about through a 25% stock dividend in 1925.

ALPHA PORTLAND CEMENT CO. INCOME ACCOUNT, 1923-1926, INCLUSIVE

	Year ended December 31			
	1926	1925	1924	1923
Gross sales	$17,250,792	$20,128,921	$20,203,840	$20,629,502
Net income after depreciation, taxes and sundry adjustments	2,603,498	3,858,246	3,085,850	3,028,399
Dividends paid	1,621,124	1,088,000	1,088,000	1,088,000
Surplus for year	982,374	2,770,246	1,997,850	1,940,399
Profit and loss surplus	4,567,273	4,053,004	5,516,432	5,268,492
Earned a share:				
Preferred	130.17	192.91	154.29	151.42
No par common	4.16	6.19	4.97	4.88

The balance sheet shows a strong financial position, although the 1926 year-end condition was not as favorable as at the close of 1925, due to the expenditure during the year of large sums out of current funds for plant expansion. Land, buildings, equipment, etc., after depreciation, were carried at December 31, 1926, at $19,018,104, against $16,191,124 at the previous year end. Net working capital was $7,915,347, as compared with $9,554,797 at the close of 1925, the greater part of the decrease coming in the cash and marketable securities.

ALPHA PORTLAND CEMENT CO. BALANCE SHEET, 1923-26, INCLUSIVE

	1926	1925	1924	1923
Cash	$ 2,631,181	$ 3,145,707	$ 4,413,909	$ 1,454,147
Marketable securities	2,370,663	3,125,869	854,416	1,132,509
Accounts and bills receivable	528,318	588,371	460,968	662,031
Inventories	3,337,816	3,371,230	3,196,495	3,364,008
Total current assets	8,867,978	10,231,177	8,925,788	6,612,690
Total current liabilities	952,631	676,380	826,684	954,307
Net working capital	7,915,347	9,554,797	8,099,104	5,658,383
Land, building, equipment, etc., net of depreciation	19,018,104	16,191,424	15,483,008	15,836,871
Due from affiliated companies	.....	803,624	554,229	599,657
Preferred stock	2,000,000	2,000,000	2,000,000	2,000,000
Common stock	19,750,000	19,750,000	15,800,000	15,800,000
Sundry reserves	1,520,577	1,583,187	1,601,697	1,561,541
Profit and loss surplus	4,567,273	4,053,004	5,516,342	5,268,492

The company has no funded debt outstanding. The $2,000,000 of preferred stock which is oustanding is entitled to cumulative dividends at the rate of 7% per annum, and is callable at any time on 90 days' notice at 125. Regular dividends have been paid on the preferred since its issuance. Recent prices are around 115, yielding about 6%.

The no par common stock, which is on a $3 dividend basis, is traded in on the New York Curb; 1926 price range was from 37 to 45½, with a December 31 closing of 39. During January of the present year the price moved up to 42½, but has again receded to current levels around 38. At this price the stock yields about 8.3%. The market price is of course affected by the relatively small margin by which dividend requirements were covered in 1926, and by the fact that the income of the company is perhaps by no means stabilized around the present level, net prior to 1923 having been somewhat smaller than has been shown in the last four years. The common stock, however, occupies a strong assets position, preceded as it is by but $2,000,000 of a senior issue.—*Chicago Journal of Commerce.*

New Bessemer Limestone and Cement Stock Offered

OTIS & CO. and Wick & Co., Cleveland, Ohio, are offering 50,000 shares class A stock (no par value) of the Bessemer Limestone and Cement Co. at $31 per share. This offering is in connection with the recent organization and financing of the Bessemer company under the laws of Delaware to acquire the properties and business of the Ohio corporation of the same name. For details of the company properties, organization and earlier financing, see ROCK PRODUCTS, February 19 issue.

Class A stock is entitled to cumulative preferential dividends at rate of $3 a share per annum and is callable at $45 and dividends. It shares equally with the class B stock in any dividends that may be declared after payment of $3 a share on 100,000 shares of class B stock. Class A and B stock have equal voting right.

Charles Warner Company Annual Report

THE Charles Warner Co. reports for the year ended December 31, 1926, net profits of $363,093 after deducting all expenses incident to operation, taxes, insurance, rentals, maintenance, net credit losses, depreciation, depletion, interest and Federal tax, equivalent after preferred dividends to $3.17 per share on 95,596 shares of common stock outstanding. The following is President Charles Warner's report to the stockholders and directors at their annual meeting:

"The demand for our sand and gravel products held up well throughout the past year and the results showed a satisfactory increase in sales volume. This was due to the sustained activity in the class of construction work using concrete, such as large public works and buildings. On the other hand, residence construction receded considerably during the latter part of 1926, resulting in a decrease in sales volume of our building lime products. The sale of agricultural lime products showed improvement.

"The net earnings of the company, after all charges, provided an increase available to common stockholders of 23% over 1925 results. This was largely due to the steady improvement that has been made in the operating efficiency of the company's major sand and gravel operation at Manor, Penn., on the Delaware river, which plant was constructed in the year 1924 and placed in partial operation during the year 1925.

"While the net earnings applicable to common stock increased in the year over 23% above the preceding year, the amount of common stock outstanding was increased only slightly over 1%. This increase was due to conversion of the company's outstanding bonds in the par amount of $26,500 for 1092½ shares as provided under the deed of trust. During the year the company made a total reduction of $104,500 in its outstanding bonds through operation of the sinking fund and by conversion; and during the same period the operation of the first preferred redemption fund withdrew and cancelled 559 shares of said stock.

"During 1926 we increased substantially the manufacturing capacity and sales of the American Lime & Stone Co. (controlled and operated by the Warner company) by the addition of a second large rotary kiln unit for the manufacture of our improved Bell-Mine chemical lime products, together with the accessory machinery and storage capacity to balance the increased output.

"During the current year the company also acquired a substantial stock interest in and representation on the board of Henry E. Strathmann, Inc., which company operates a chain of five retail yards in the city of Philadelphia and is one of our largest customers. Our company had previously acquired a similar interest in and relationship to the West Jersey Sand & Supply Corp. of Philadelphia, and the tie-in with the Strathmann organization was further assisted by the West

Jersey corporation's purchasing a similar interest in and representation upon the Board of the Strathmann corporation. These various steps have been taken for the purpose of strengthening our distributing arrangements and further to co-ordinate our production and distribution in the large markets of Philadelphia.

"The construction prospects for 1927 appear in the main to be satisfactory, though the volume of such work may not be quite so large as during 1926. There is much discussion among authorities in the construction and financial world as to the points of saturation in different communities of different kinds of buildings. There is no doubt that in some respects, and particularly as applied to older types of buildings which are partially obsolete as to character or location, that saturation exists. But the main outstanding fact is that the population increase, the urge towards a higher plane of living, and the insistent demand for better conditions for industrial and office service, will continue to require a large volume of new construction work as long as capital is plentiful and our country prosperous."

CHARLES WARNER CO. CONDENSED BALANCE SHEET
(December 31, 1926)

Assets

Cash	$82,889
Accounts receivable	335,924
Merchandise (cost)	238,676
Securities	365,274
Real estate, buildings, kilns, structures, equipment, motor trucks, horses, wagons, tugs, dredges, barges and development (net of depreciation)	4,242,074
	$5,264,837

Liabilities

Accounts payable	$54,512
Bills payable	None
Accrued accounts, including common dividend payable January 10, 1927, preferred dividend payable January 27, 1927, and federal tax	145,755
Convertible gold bonds	299,500
First preferred stock	786,300
Second preferred stock	177,100
Common stock ($100 par value)	200
Common stock (no par value) 95,596 shares	2,766,694
Surplus, reserves and undivided profits	1,021,944
Miscellaneous and deferred	12,832
	$5,264,837

GROSS SALES

	1924	1925	1926
Lime products	$1,196,843	$1,277,112	$1,079,392
Sand and gravel	1,315,293	1,685,442	1,772,123
Other sales and miscellaneous	425,786	364,940	393,570
	$2,937,922	$3,327,494	$3,245,085

INCOME STATEMENT
(For Year Ended December 31, 1926)

Total earnings after deducting all expenses incident to operation, inclusive of general expenses, ordinary taxes, insurance, rentals, and maintenance		$735,444.77
Deduct—		
Net credit losses	$3,741.10	
Depreciation	213,650.00	
Depletion	65,662.79	
Net interest	28,039.32	
Allowance for federal tax	52,000.00	
		$363,093.21
Balance to credit of surplus, available for dividends, etc.		372,351.56
Dividends paid to holders of first and second preferred stock		69,021.75
Balance available for distribution to common stock holders or other purposes		$303,329.81

Peerless Portland 1926 Report

PEERLESS PORTLAND CEMENT CO., Detroit, Mich., for the year ended December 31 reports a net profit of $495,265 before depreciation and federal taxes. Balance sheet shows current assets of $1,165,664 and current liabilities of $267,559. Total assets were $6,884,576.

International Cement Earnings

PRELIMINARY statement of International Cement Corp. for year ended December 31, 1926, as compiled from quarterly reports, shows net income of $4,348,551 after depreciation, interest and federal taxes, equivalent after 7% preferred dividend requirements to $6.51 a share earned on outstanding 562,500 no par shares of common stock. This compares with net income of $3,976,385 as shown in final report for 1925, equal to $7.03 a share on 500,000 shares then outstanding.

Net income for fourth quarter of 1926 totaled $1,164,010 after above charges, or $1.76 a share on common, against $1,379,582, or $2.14 a share, in preceding quarter, and $793,147, or $1.23 a share, in final quarter of 1925.

The following are the quarterly earnings in 1926 and 1925:

	Quarter ended Dec. 31 1926	1925
Gross sales	$6,742,245	$5,161,695
Packages, discts. & allow.	1,240,882	970,057
Manufacturing costs	2,736,422	2,123,832
Depreciation	401,197	287,076
Interest charges and financial expenses	30,789	.....
Shipping, selling and administrative expenses	1,044,787	944,364
Net profit	$1,288,168	$ 836,365
Miscellaneous income	.....	113,865
Total income	$1,288,168	$ 950,229
Reserve for federal taxes and contingencies	124,158	157,082
Net to surplus	$1,164,010	$ 793,147
Shares common stock outstanding (no par)	562,500	500,000
Earnings per share on com.	$1.77	$1.07

Preliminary statement for 1926, compiled from quarterly reports, compares as follows:

INTERNATIONAL CEMENT CORP. REPORTS, 1923-1926, INCLUSIVE

	*1926	1925	1924	1923
Gross sales	$26,470,759	$21,559,723	$16,700,132	$11,289,116
Expenses	19,576,464	†17,085,896	†13,063,741	†8,418,948
Depreciation	1,591,379	.....	.....	.....
Net	$ 5,302,916	$ 4,473,827	$ 3,636,391	$ 2,870,168
Other income	.....	164,994	135,006	102,262
Total income	$ 5,302,916	$ 4,638,821	$ 3,771,397	$ 2,972,430
Interest, federal taxes, etc.	954,365	662,436	723,891	549,853
Net income	$ 4,348,551	$ 3,976,385	$ 3,047,506	$ 2,422,577

*Compiled from quarterly reports and subject to yearly adjustments.
†Includes depreciation.

In his annual report to the stockholders, President H. Struckmann said in part:

"Market conditions in the foreign countries we are serving continue very satisfactory, and during the latter part of 1926 we closed a contract with the Cuban government for their entire cement requirements for the next four years.

"During the last few weeks some price reductions have taken place in the domestic markets and the probability is that during the year 1927 somewhat lower prices will prevail, especially in the eastern district. Your management believes, however, that this loss in revenue will be largely offset by lower operating costs and additional capacity available this year."

Old Mission Portland Merged With Pacific Portland

AN agreement to merge the properties of the Pacific Portland Cement Co., Consolidated, and the Old Mission Portland Cement Co. into a California corporation to be known as the Pacific Portland Cement Co., with a capital of $30,000,000, has been announced, according to a recent report in the New York *Herald-Tribune*. Stock at present will be issued only to the two companies in exchange for their properties. Meetings of stockholders of both companies will be held to ratify the consolidation within a short time after which complete details of the consolidation will be made public.

The Pacific company owns and operates large cement mills at Cement and Redwood City, Calif., and gypsum plants at Gerlach, Nev., and Plaster City, Calif. The Old Mission company's cement mill is in San Juan Bautista, Calif. Both companies have large holdings of raw cement material. The combined output of the three cement mills is upwards of 10,000 bbl. per day.

Beaver Products Takes Over Southern Gypsum

FURTHER details on the recent purchase of the Southern Gypsum Co.'s plant and properties by the Beaver Products Co., New York, are reported in the New York *Herald-Tribune*. According to the report, the price paid was about $1,000,000, or considerably above that of capital stock value of the company, which totaled $750,000. The Beaver Products Co., it is said, plans to expend additional money in development and expansion of the plant within a short time.

Dr. Frank A. Wilder, president of the Southern Gypsum Co., has turned over its management to the new corporation, it is said, and has gone to Florida to spend the remainder of the winter with Charles Hull Ewing of Chicago, who has been secretary and a large stockholder in the company. Albert W. Ristine, formerly superintendent of the selling company, will remain with the new organization, it is announced.

A complete description of the plant at North Holston, Va., was published in ROCK PRODUCTS, February 5, 1927, issue, at which time an announcement of the purchase also appeared.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Jan. 29	Limestone Flux Week ended Feb. 5	Sand, Stone and Gravel Week ended Jan. 29	Sand, Stone and Gravel Week ended Feb. 5
Eastern	2,104	2,182	1,217	1,499
Allegheny	3,131	3,331	2,110	2,451
Pocahontas	139	146	277	465
Southern	430	480	9,827	9,706
Northwestern	752	684	1,522	1,805
Central Western	357	466	4,415	4,478
Southwestern	66	219	3,116	3,502
Total	6,979	7,508	22,484	23,906

COMPARATIVE TOTAL LOADINGS, 1926 AND 1927

	1926	1927
Limestone flux	*55,483*	*42,442*
Sand, stone and gravel	*115,594*	*136,675*

CENTRAL FREIGHT ASSOCIATION DOCKET

15042. **Sand** (except blast, core, engine, filter, fire or furnace, glass, grinding or polishing, loam, molding or silica), and gravel, carloads, South Heights, Penn., to Revere Works, Penn. Present rate, 16c; proposed, 135c per net ton.

15043. **Sand (lake) and gravel**, carloads, Lorain, O., to points in Ohio, following rates: (Present and proposed rates in cents per 2,000 lb.)

To	Prop.	Pres.
Akron	80	90
Barberton	80	90
Canton	90	100
Dover	90	110
New Philadelphia	90	110
Wooster	90	95

15059. **Sand and gravel**, carloads, Loudonville, O., to Ashland and Bucyrus, O. Present rates, 6th class of 11½c to Bucyrus and 120c per net ton to Ashland, O.; proposed, 80c per net ton.

15078. **Stone, crushed, rip-rap**, carloads, Bloomington and Victor, Ind., to Cairo and Levings, Ill. Present rate, 6th class; proposed, 139c per net ton.

15085. **Gravel, sand**, except blast, core, engine filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Columbus, Ind., to Glenwood, Ind. Present rate: $2.75 per net ton; proposed, 90c per net ton.

15088. **Gravel and sand**, except blast, core, engine, filter, fire or furnace, glass, grinding or polishing, loam, molding or silica, in open top cars, carloads, Anderson, Ind., to Ashland Ind., to Hagerstown, and to New Castle, Ind. Present rates: 75c to Ashland and New Castle, Ind., and 76c per net ton to Hagerstown, Ind. Proposed: 65c from Anderson, Ind., to Ashland, Ind.; from Anderson, Ind., to Hagerstown, 70c, and to New Castle, Ind., 60c per net ton.

15091. **Sand and gravel**, carloads, to Kensington, Ohio, from Massillon, also from siding of the Buck Hill Washed Sand and Gravel Co., Ohio. Present rate: 90c per net ton; proposed, 80c per net ton.

15092. **Gravel and sand**, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Evansville, Ind., to Daylight Ind. Present rate: 66c per net ton; proposed, 50c per net ton.

Illinois Freight Association Docket

4005. **Sand and gravel**, carloads, from Chillicothe, Ill., to Mediapolis, Sperry and Latty, Iowa. Rates per net ton. Present, $1.90; proposed, $1.25.

1526. **Sand, gravel and crushed stone**, carloads, minimum weight marked capacity of car, to Illinois Central R. R. stations in Illinois (rates in cents per net ton).

Cairo, Ill.

To (representative points)	Present	Proposed
Belleville, Ill.	126	90
Murphysboro, Ill.	85	65
Centralia, Ill.	100	85
Wolf Lake, Ill.	76	65
Christopher, Ill.	92	65
Herrin, Ill.	90	65

Metropolis, Ill.

To (representative points)	Present	Proposed
Belleville, Ill.	126	90
Murphysboro, Ill.	89	65
Centralia, Ill.	100	90
Wolf Lake, Ill.	105	85
Christopher, Ill.	92	65
Herrin, Ill.	90	65

Shetlerville, Ill.

To (representative points)	Present	Proposed
Belleville, Ill.	126	90
Murphysboro, Ill.	89	65
Centralia, Ill.	100	90
Wolf Lake, Ill.	105	85
Chrstopher, Ill.	92	65
Herrin, Ill.	90	65

1526. **Sand and gravel**, carloads, minimum weight marked capacity of car, from Metrpolis, Ill., to Steelville, Ill., on W. C. & W. R. R. Present: Class E; proposed, $1.08 per ton of 2000 lb.

3026. **Sand**, in open top cars, viz., blast, core, engine, filter, fire, furnace, etc., from Bluff City, Greenville, Lutz Spur, Mulberry Grove and Vandalia, Ill., to Centralia, Ill. Present: $1.26 per net ton; proposed, $1.50 per net ton.

3137A. **Sand and gravel**, carloads, from Rock Island and Moline, Ill., to Galva, Bishop Hill, Ulah and Cambridge, Ill. Present: 88c; proposed, 76c.

4011. **Crushed stone**, carloads, minimum weight marked capacity of car. Rates in cents per net ton.

To	From Lehigh, Ill. Present	From Lehigh, Ill. Proposed
Compro, Ill.	Class rates	113
Beechly, Ill.	Class rates	113
Kinkaid, Ill.	Class rates	113
Taylorville, Ill.	Class rates	113
To	**From Thornton, Ill. Present**	**From Thornton, Ill. Proposed**
Compro, Ill.	Class rates	126
Beechly, Ill.	Class rates	126
Kinkaid, Ill.	Class rates	126
Taylorville, Ill.	Class rates	126

32240. **Crushed stone** from Boxley, Va., to Churchland, Va. Present rate, $2.61 per net ton (Combination). Proposed rate on stone, crushed, minimum weight 90% of marked capacity of car, except when car is loaded to full visible capacity actual weight will govern, but not less than 40,000 lb., from Boxley, Va., to Churchland, Va., $1.26 per net ton, based on the proposed Georgia scale, less 10%, for the A. C. L. R. R. distance.

32247. **Sand and gravel** from Jackson's Lake, Prattville Junction, Coosada and Oktamulkee, Ala., to Apalachicola, Fla. It is proposed to establish reduced rate of $2.14 per net ton on sand and gravel, carloads, minimum weight marked capacity of car, except when cars are loaded to their full visible capacity actual weight will govern from the origins mentioned to Apalachicola, Fla., same as rate recently approved under Submittal 30504 from Montgomery to Apalachicola, Fla.

32248. **Sand and gravel** from Jackson's Lake, Prattville Junction, Coosada and Oktamulke, Ala., to Nashville, Ga. It is proposed to establish reduced rate of $1.76 per net ton on sand and gravel, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will govern from the origins mentioned to Nashville, Ga., same as rate recently approved under Submittal 31245 from Montgomery, Ala., to Nashville, Ga.

32249. **Sand and gravel** from Jackson's Lake, Prattville Junction, Coosada and Oktamulke, Ala., to Aucilla, Chaires and Perkins, Fla. It is proposed to establish reduced rate of 189 cents per net ton on sand and gravel, in straight or mixed carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will govern from and to the above-named points, same as rate recently approved under Submittal 31441 from Montgomery, Ala., to the same destinations.

32274. **Sand and gravel** from Louisville, Ky., to Rogers Gap, Sadieville and Delaplain, Ky. It is proposed to establish the following reduced rates on sand and gravel, straight or mixed carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, from Louisville, Ky.: To Sadieville, Ky., $1.35; Rogers Gap and Delaplain, Ky., $1.31 per net ton, made by use of the full single line scale published in Southern Ry. I. C. C. A10028, which applies between points in Kentucky.

32297. **Limestone** from Ladds, Ga., to Dothan, Ala. Present rate, $2.59 per net ton. Proposed rate on limestone, ground or pulverized, carloads, minimum weight marked capacity of car, except when cars are loaded to their full visible capacity, actual weight will govern, from Ladds, Ga., to Dothan, Ala., $2.30 per net ton, made on basis of the proposed Georgia joint scale, less 10%.

32305. **Gravel** from Camden, Tenn., to M. & O. R. R. stations in Mississippi. It is proposed to revise rates on gravel, carloads, minimum weight stenciled capacity of car, except where cars are loaded to visible capacity and (or) in the absence of weighing facilities at shipping point, if freight is weighed in transit or at destination, carloads, minimum weight will be 90% of the stenciled capacity of car, from Camden, Tenn., on basis of the scale prescribed by the Interstate Commerce Commission in Docket 17517. The present and proposed rates to representative points are as follows (in cents per net ton):

To	Present	Proposed
Corinth, Miss.	102	125
Tueplo, Miss.	102	140
West Point, Miss.	113	150
Macon, Miss.	113	160
Electric Mills, Miss.	113	170
Meridian, Miss.	113	175

32311. **Limestone**, ground or pulverized, from Buquo and Hot Springs, N. C., to Chicago, Ill. Ohio River combination now applies. Proposed rates on limestone, ground or pulverized, carloads, minimum weight marked capacity of car, but not less than 60,000 lb., from and to points mentioned, $3.82 per net ton, based on the Sou. Ry. System mileage scale for the distance to Princeton, adding thereto the proportion acceptable to the C. & E. I. R. R.

32337. **Limestone**, ground, powdered or pulverized, from Birmingham, Ensley and Gate City, Ala., to Chattanooga, Tenn. Present rates: From Birmingham and Gate City, $1.24; from Ensley, $6.10 per net ton. Proposed rate on limestone, ground, powdered, or pulverized, carloads, minimum weight 90% marked capacity of car, except when loaded to visible capacity, actual weight will govern, $1.35 per net ton, which is single line from the points mentioned to Chattanooga, scale for distance of 150 miles and over 120, as maintained by the Southern Ry. from Atlanta, Ga. (when from Cartersville, Ladds or Whitestone, Ga.), and from various producing points in Alabama, Georgia, North Carolina, Tennessee and Virginia to points on the Southern Ry. (See So. Ry., I. C. C. A-10056.)

SOUTHERN FREIGHT ASSOCIATION DOCKET

32061. **Sand and gravel** from Nashville, Tenn., to Madison and Edenwold, Tenn. It is proposed to establish reduced intrastate rate of 60c per net ton on sand and gravel, straight or mixed carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible

capacity actual weight shall govern, from Nashville, Tenn., to Madison and Edenwold, Tenn., such rate to expire June 30, 1927. The rate suggested is merely a restoration of rate formerly in effect.

32063. **Crushed marble and stone** from Tate, Whitestone, Ga., Emauhee, Brownson and Gantt's Quarry, Ala., to Centralia, Ill. In lieu of combination basis, it is proposed to establish commodity rate of 369c per net ton, on: From Tate, Ga., marble, crushed in bags, carloads; from Whitestone, Ga., stone, crushed, carloads; from Emauhee, Brownson and Gantt's Quarry, Ala., on marble, crushed, carloads. The proposed rate to be subject to minimum weight 90% of marked capacity of car, except that when cars are loaded to their visible capacity, actual weight shall govern. Made same as rate in effect on crushed stone from Whitestone, Ga., to Vandalia, Ill.

32123. **Sand** from Birmingham and North Birmingham, Ala., to Rome, Ga., and Roanoke, Ala. It is proposed to establish the following reduced rates on sand, carloads, minimum weight 90% of the marked capacity of car, except when cars are loaded to their visible capacity actual weight will govern, from Birmingham and North Birmingham, Ala.: To Rome, Ga., 122c per net ton, made in line with rates to other points in that vicinity; to Roanoke, Ala., 125c per net ton (intrastate); same as rate in effect to La Grange, Ga.

32156. **Crushed stone** from Norfolk, Va., to Arringdale, Moyock and Snowden, N. C. It is proposed to establish the following reduced rates on stone, crushed, carloads, minimum weight 100,000 lb. (when 90% of marked capacity of car is less than 100,000 lb. such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity actual weight shall govern, from Norfolk, Va.: To Arringdale and Moyock, N. C., 80c per net ton; to Snowden, N. C., 92c per net ton. The suggested rates are the same as the rates on sand (except glass and molding sand) and gravel.

32184. **Lime**, from Milltown, Ind., to Winchester and Paris, Ky. Present rate, 15½c per 100 lb. Proposed rate on lime, common, hydrated, quick and slaked, carloads, minimum weight as per Consolidated Classification, from and to points mentioned, 14c per 100 lb., same as rate in effect to High Bridge, Nicholasville, Junction City and other points in that vicinity.

TRANSCONTINENTAL FREIGHT BUREAU DOCKET

7589. **Limestone**, ground, carloads, westbound: Request for rate of 50c per 100 lb. on ground limestone, carloads, minimum weight 80,000 lb., from Group D to Pacific coast points under Tariffs 1A (I. C. C. Nos. 63, A173, 1827 and 1177 of Frank Van Ummersen, H. Wilson, B. T. Jones and H. G. Toll, Agents, respectively) and 4X (I. C. C. Nos. 64, A175, 1839 and 1178 of Frank Van Ummersen, H. Wilson, B. T. Jones and H. G. Toll, Agents, respectively).

7590. **Hydrated lime**, carloads, eastbound: Request for rate of 50c per 100 lb. on hydrated lime, carloads, from Sonora, Calif., to Groups E, F, G, H and J under Tariff 3U (I. C. C. No. 1174, H. G. Toll, Agent).

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

11769. **Agricultural lime** and **agricultural hydrated lime**, from Winooski, Fonda Jct., Highgate Springs and Swanton, Vt., to stations on the N. Y. O. & W. Ry., 20½c, except to Oakland, Hartwood, St. Joseph's and Monticello, N. Y., 26½c, via Rouses Point, N. Y.-D. & H. Co.-Sidney, N. Y.-N. Y. O. & W. Ry. Reason—Necessary to be on a comparable basis with rates to Buffalo, N. Y., N. Y. C., C. V. Ry. Tariff I. C. C. A5593.

11776. **Sand**, sea, carloads, minimum weight 90% of marked capacity of car, from Provincetown, Mass., to Charleston, N. H., 12. Reason—To permit of a continued movement of this sand in quantities, from and to the points involved.

WESTERN TRUNK LINE DOCKET

3089D. **Stone**, crushed, carloads, minimum weight 90% of marked capacity of car, except that when actual weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will be the minimum weight. In no case shall the minimum weight be less than 40,000 lbs. From Quincy, Ill., to points in Missouri on the Mo. Pac. R. R., Brentwood, Mo., to Maes Spur, Mo., inclusive, Kirkwood, Mo., to Pixleys, Mo., inclusive, as shown in Mo. Pac. Tariff No. 4381F, I. C. C. A6624. Present: Class E rate; proposed, 11½c per 100 lg. (By shipper.)

3545R. **Sand, gravel**, carloads, minimum weight 90% of marked capacity of the car, except that when weight of shipment loaded to full visible capacity of car is less than 90% of the marked capacity of the car, actual weight will apply. In no case shall the minimum weight be less than 40,000 lb. From Group A (Kansas City-St. Joseph) to Group 1 (St. Louis, Mo.) Present: Class E rate of 17c generally applies; proposed, 11c per 100 lb.

1564H. **Stone, crushed**, carloads, minimum weight 90% of marked capacity of car, but not less than 50,000 lb., from Quartzite, Jasper and Pipestone, Minn., also Sioux Falls, S. D., to Cedar Rapids, Iowa. Present: 11½c per 100 lb.; proposed, 10c per 100 lb.

3089D. **Limestone, agricultural**, carloads, minimum weight 90% of marked capacity of car, except when loaded to full visible capacity actual weight, but not less than 40,000 lb., from Keokuk, Montrose and McManus and Tucker Siding, Ia., to representative points in Missouri:

To	Keokuk Present Cwt.	Keokuk Proposed Net ton
Ashton	3½	$0.70
Crawford	4	.80
Edina	5½	.90
Keble	6½	1.10
Meadville	11	1.30
Mexico	11	1.50

To	Montrose Present Cwt.	Montrose Proposed Net ton
Ashton	3½	$0.70
Crawford	4½	.90
Edina	6	1.00
Keble	6½	1.10
Meadville	11	1.40
Mexico	11	1.50

To	McManus and Tucker Siding Present Cwt.	McManus and Tucker Siding Proposed Net ton
Ashton	3½	$0.70
Crawford	4	.80
Edina	5½	.90
Keble	6½	1.10
Meadville	11	1.30
Mexico	11	1.50

SOUTHWESTERN FREIGHT BUREAU DOCKET

11325. **Lime**, from Mosher and Ste. Genevieve, Mo., to Rhinelander, Wis. To establish a rate of 27c per 100 lb. on lime, carloads, minimum weight 30,000 lb. from Mosher and Ste. Genevieve, Mo., to Rhinelander, Wis. It is stated that proposed rate of 27c per 100 lb. is 2c higher than rate in effect from the Hannibal and Mitchell Group, which is basis for rates on lime from Mosher and Ste. Genevieve, Mo., to points in Wisconsin that was authorized under W. T. L. Docket 403-Series.

16278. Agricultural limestone rates from West Stockbridge, Mass., to points in Eastern New York, unreasonable and unduly prejudicial. Specific rates, ranging from 7.5 cents from West Stockbridge to Albany, N. Y., and 13 cents to Lehigh, Pa., were approved. The rate to Yonkers is 10 cents and Binghamton 11 cents.

No order was issued, but the carriers were given 90 days to put the adjustment into effect. The destination area, roughly, was the triangle bounded by lines from New York City to Binghamton, Binghamton to Albany, and Albany to New York City.

17337. Shipments of sand and gravel from Beloit, Wis., to Beach and Waukegan, Ill., and Kenosha, Wis., since March 1, 1924, not misrouted and rates not unreasonable or unlawful. Reparation of $2.70 per car imposed for switching charge alleged inapplicable.

17190. Crushed stone rates from Racine, Wis., to Chicago and other Illinois points, since June 1, 1923 not unjust or unreasonable.

18172. Rates on tripoli from Seneca, Mo., to Pacific coast points, unreasonable and preferential, as they exceed silica rates from Tamus and Ottawa, Ill., and Rogers, Ark. Proposed to place tripoli rates on equitable basis.

18592. Rate of $1.20 per ton charged in 1923 on sand and gravel from Paducah, Ky., to Menglewood, Tenn., not unreasonable. Reparation to the basis of subsequent rates denied.

17295. Combination rate of $11.325 per ton of fluorspar from Mesilla Park, N. M., to Torrance, Calif., applied on 1922 shipments unreasonable and reparation awarded.

16908. Silica sand rates from Ottawa district to St. Joseph and Benton Harbor, Mich., not unreasonable or unlawful as compared with rates from same points to other Central Freight Association territory.

I. and S. **2852.** Schedule cancelling interstate commodity rates on stone, granite and marble from Marietta, Ga., to Elberton, Ga., and constructing rates to interstate destinations, resulting in application of higher combinations, ordered suspended from February 15 to June 15, 1927.

15585. Overcharge for detention of sand and gravel cars not allowable because railroad did not comply with terms of demurrage tariff, failing to send notice of arrival to consignee. Reparation allowed.

18710. Sand rates of 75c per 2000 lb. from Willow Creek and Crisman, Ind., to Chicago Heights not unreasonable and complaint dismissed.

18347. Rate of 70c per 100 lb. on crushed and sacked marble, in carloads, from Gantt's Quarry, Ala., to Biloxi, Miss., imposed in 1924 unreasonable to the extent it exceeded a rate of $2.10 per ton, minimum 90% marked capacity of car. Reparation awarded on that basis.

Cement Tubs Put on Same Rate Basis as Plumbers' Supplies

EXAMINER MARTIN J. WALSH, in No. 18475, Chicago Granatine Manufacturing Co. vs. Illinois Central R. R., said the commission should find the rate charged on cement laundry tubs, carloads, from Chicago, Ill., to New Orleans, La., between October 13, 1923, and February 16, 1925, was unreasonable but not unduly prejudicial. The complaint alleged the rate of 103c was both unreasonable and unduly prejudicial. The examiner said the rate should be found unreasonable to the extent it exceeded a rate of 81c applicable on plumbers' goods, which included enameled iron and porcelain laundry tubs, in the period of movement, and award reparation to that basis on several carloads of cement tubs.

New Gypsum Developments in Nova Scotia

E. N. HALTON FYLES, geologist of Montreal, announces that the Canada Cement Co., Ltd., will shortly commence extensive gypsum mining developments on the north side of the harbor at Antigonish, N. S. Some 24 properties have been taken up by the company and work will commence as soon as the frost is out of the ground this spring. The construction will include shipping piers, storage plant, crusher and railway lines to the quarries.

Current Abstracts of Foreign Literature

Methods of Measuring Very Fine Particles. A method of determining the diameters of very fine particles, which is said to be correct to one micron is described by P. Lukirsky and M. Kosman of the Physical-Technical Laboratory of Leningrad, Russia in the transactions of the Society of Chemical Industry (London.) The method employs three sedimenting tubes, the one in which the powder to be studied is settled being connected to the other tubes at different levels. The fall of the powder in the space between the connections of different levels causes a difference in the hydrostatic head of the connecting tubes (which contain only liquid.) A formula has been worked out from which the velocity of fall is computed from variations in the difference in head and from this velocity the radius of the diameter of the particle is figured from Stokes law. The apparatus, from a simple form, has been developed to a very accurate automatic recording device by which a curve of settling velocities may be obtained. Simply measuring the ordinates of this curve and referring to a table gives the diameters of the particles composing the sample of powder.—*British Journal of the Society of Chemical Industry,* (1927), **46,** 4.

Constitution of Portland Cement. Review of the investigations carried out by Shepherd, Rankin, Wright and Janecke. *Zement* (1926), **610-12, 643-46.**

Specific Heat of Portland Cement Clinker. Fritz Hartner, Jr., determined the specific heat of portland cement clinker of the following composition: Loss on ignition, 0.14%; silica, 23.26%; alumina, 6.06%; iron oxide, 2.58%; lime, 65.80%; magnesia, 1.40%, and sulphur trioxide, 0.43%.

From 0.2 to 0.3 grams of clinker was heated in an electric furnace and the specific heat determined at different temperatures by the calorimeter method, checking against a known copper sample. The data as tabulated are:

Temperature internal Degrees Cent.	Specific heat
18- 130	0.205
18- 230	0.223
18- 390	0.247
18- 500	0.258
18- 610	0.266
18- 720	0.272
18- 835	0.278
18- 930	0.281
18-1035	0.31
18-1048	0.32

Above 950 deg. C. specific heat determinations could not be checked. Portland cement clinker is considered by the author as a non-homogeneous system, the components of which begin to melt at 950-1000 deg. C. and this melting heat added to the specific heat at that temperature, possibly accounts for the abnormal rise of specific heat observed.—*Zement* (1927), **3,** 57.

Alumina from Natural Silicates. Clay, kaolin or other aluminum silicates are treated with a sodium carbonate solution, pressure applied and the mixture allowed to cool. After filtration, the filter is treated with sulphuric acid to obtain aluminum and iron sulphates. The filtrate is recovered and put back into the process. *Czecho-Slovakian Patent No.* 18,648.

Research on the Hydration of Dicalcium and Tricalcium Silicate. The hydration of these silicates was studied but little in the past, due to the difficulty of obtaining large enough samples of the pure compounds. The author (Beckmann) was successful in producing 250 gm. of $2CaO \cdot SiO_2$ and 175 gm. of $3CaO \cdot SiO_2$, by heating a properly proportioned mixture of pure $CaCO_3$ and SiO_2 to 1000 deg C. in a muffle, mixing it with distilled water to a plastic paste, from which rods, 5 mm. in diameter and 15 cm. long, were formed. These were dried at 110 deg. in a carbon dioxide blast until they acquired sufficient strength. Their chemical composition was then tested on a sample rod and the rods melted in an oxy-acetylene flame. The drops were allowed to fall on mercury kept cool by running water. This intensive cooling prevented the decomposition of the melts.

The study of the hydration processes consisted of observing the rise in temperature and the change of electric conductivity during hydration. A thermometer graduated to 1/50 deg. C. was inserted into the setting mass. Only slight thermal effects were noted in the hydraulic and the non-hydraulic forms of $2CaO \cdot SiO_2$. The hydration of $3CaO \cdot SiO_2$, however, takes place with a considerably greater rise in temperature.

The electric conductivity was measured by Kohlrausch's method making use of the Wheatstone bridge and buzzer. In all cases a marked increase of conductivity was noted at the start until a maximum value was reached. With low conductivity during hydration the maximum value was reached soon. The trend of the curves becoming almost parallel to the time axis meant a condition of stable equilibrium. The conductivity of $3CaO \cdot SiO_2$ did not show as pronounced changes as that of $2CaO \cdot SiO_2$.

All samples which, regardless of the method of handling, reached the same consistency in the same period of time—assuming equal quantities of water and thorough mixing—showed the same thermal and electrolytic phenomena with relation to time.

The setting process is to be regarded as a colloidal reaction. This coagulation can be produced by a sufficient quantity of electrolytes or by a sufficiently high concentration of the sol. The high lime content of the compound $3CaO \cdot SiO_2$ furnishes favorable conditions for the gel formation at the start, so that the coagulation process predominates, absorbing more ions than are produced by the decomposition of $3CaO \cdot SiO_2$. The author is of the opinion that the compound $3CaO \cdot SiO_2$ is a solid solution of one molecule of CaO in $2CaO \cdot SiO_2$. The setting process of $3CaO \cdot SiO_2$ can then be divided into two reactions: the coagulation of $2CaO \cdot SiO_2$ and a parallel strong exothermic hydration of the lime dissolved in $2CaO \cdot SiO_2$.

Additional tests were made to determine the quantity of dissolved lime and the quantity of water absorbed by the silicates. *Zement* **3,** 37—40, **4,** 55-58 (1927).

Refractory Magnesite Forms. Lime and magnesite low in iron or lime and magnesia are fused in an electric furnace. After cooling and pulverizing, fine ground magnesite is added and the mass again fused and finally poured into molds. *German Patent No.* 437,106.

Change of Time of Set of Portland Cement. Cements with variable times of set were prepared and investigated by R. Grun. Their tests proved that this change occurred when the quantity of the gypsum admixture reached some critical value. This change was apparently produced by the influence of the air. Samples were exposed to the effect of—(1) Air indoors; (2) Air free from carbon dioxide, containing moisture; (3) Air free from moisture, containing carbon dioxide.

The investigations led to the conclusion that the undesirable effect was due to the carbon dioxide of the air. The reaction seemed to suggest the formation of K_2CO_3. Tests were made of cement samples containing 1.75% potassium. It was found that the formation of potassium carbonate was the reason for the change of time of set.

Tests determined that the potassium is present in cement as potassium monoaluminate, the only form soluble in water. Conclusions drawn are that cements whose gypsum content is near the critical value become quick-setting due to the effect of carbon dioxide on the aluminates present in the cement. Potassium carbonate is formed whose accelerating action cannot be counteracted by an insufficient quantity of gypsum, which might convert it into the harmless potassium sulphate. *Tonindustrie-Zeitung,* **86,** 1514 (1926).

Gypsum Processing. A gypsum product said to be more resistant to weather is made by calcining gypsum with silicic acid or clay in the presence of steam at temperatures of 1100 deg. C. or over. *German Patent No.* 438,172.

Cement Products

Cement Products at the American Concrete Institute Convention

Papers by Producers on the Problems of Operation and Production

CEMENT products were given the time and consideration that the growing importance of the industry justifies in the convention of the American Concrete Institute, February 22 to February 24. Two full sessions and practically all of a third were devoted entirely to cement products. In the other sessions many of the papers and discussions contained material especially applicable to the products industry.

Committee P-1 on standard building units made its report, asking for the continuance of the brick specification as a tentative standard, but recommending that the specifications for concrete block and tile be made permanent. It also reported on the effect of changing the grade of the aggregate while keeping the finenes modulus constant. The report was accepted. The reason for holding the brick specification tentative is that the American Society of Testing Materials is working on a brick specification and it is desirable not to have two permanent standards in effect.

Most of the papers were short, "meaty" and of a very practical nature. But there was one important technical report, on curing, that was of some length and this will be given more fully than the others in a forthcoming issue.

Operating Problems

OPERATING problems were considered in a series of 10-minute papers and ranged pretty well through every phase of the industry. Abstracts of these papers follow:

Starting in the Products Business

Starting in business was described by **W. R. Warford,** of the Warford Construction Co., Aurora, Ill. Before deciding to build a plant the local market was studied. Brick sold in Aurora for $12.50 per thousand, clay tile at 18 to 20 cents. Several block plants already in business sold block at an average price of 17 cents. It was decided that the combined production of these plants could not supply the potential demand so the decision to build a plant was made.

Tile are not used much in Aurora, hence only the manufacture of block was considered. Estimates were carefully figured from the local prices of cement, aggregate and labor. Many different types of machines were considered and every machine salesman was allowed to present his arguments. The selection of a machine was finally made on the basis of the service which would be furnished.

In making the plant layout, compactness, the position of the machines in relation to other parts, cement storage and allowance for growth were all considered. Concrete floors were sloped to allow easy trucking from the machines. For storing aggregate a silo 64 ft. high was built. Arrangements were made for handling cement and aggregate in carloads, and the layout was such that one man could attend to three mixers. Lift trucks were adopted for the transportation of blocks in the plant.

A survey of the market showed a population of 75,000 to be served within truck delivery limits. Deliveries are sometimes made as far as 13 miles.

In the curing rooms 1½ sq. ft. of radiation was allowed for each 10 sq. ft. of area. Steam pipes used for heating bring the temperature to 100 deg. or even 110 deg. F.

Aggregates cost per ton: Sand, 50c; pebbles, 50c; limestone screenings, $1.68, all purchased from commercial plants. The mixed aggregate used is:

1 cu. ft. screenings.
2 cu. ft. ¼-in. to ½ in. pebbles.
3 cu. ft. torpedo sand.

Twenty-two standard block are made per sack of cement. The limestone screenings contain 15% on ¼ in. and 60% passing 60-mesh. The great advantage of using limestone screenings is that it permits a wetter mix to be used without danger of slumping.

Effect of Using Finely Ground Cement

This unusual paper was presented by **George Chandler,** of the Superior Products Co., Detroit, Mich. Although very short, it commanded as much attention as any paper that was read.

Mr. Chandler said he was moved to experiment with finely ground cement from the reading of Professor Abrams' Bulletin No. 4, which described his researches on the effect of fine grinding of cement. From this he learned that:

Fine grinding is more effective in lean mixes than in rich mixes.

The effect of fine grinding is shown more in the 7-day strength than in the 28-day strength.

A finer cement should give a somewhat less slump for the same amount of water.

There is a gain of strength of 2 to 3% for each additional point of fine grinding. A gain of 10 points would thus give an increase in strength of at least 25%.

From these findings it seemed reasonable to expect a greater strength at the end of 24 hours' curing so that blocks could be handled and shipped sooner, if finely ground cement were to be used.

Actual results obtained were:

Cement A (not finely ground) 441 lb. in 7 days.
Cement B (finely ground) 742 lb. in 7 days.

Check results obtained were:

Cement A, 403 lb. in 7 days.
Cement B, 682 lb. in 7 days.

These tests were run under plant conditions. After they were made Cement A was ground 10 points finer so that it would equal Cement B in fineness. The blocks which were then made tested:

Cement A, 700 lb. in 5 days.
Cement B, 626 lb. in 5 days.
Cement A, 732 lb. in 8 days.
Cement B, 888 lb. in 8 days.

These tests were made on a plant and not a laboratory basis. Better than the 25% increase in strength expected was secured and this was ascribed to the greater "machinability" of the mixture. It was thought that these tests were a sufficient ground for recommending a further investigation of the matter.

In the discussion which followed a member said he had made similar tests with practically the same results.

Steam Curing Rooms for Block

In presenting this paper **Austin Crabbs**, of the Cement Products Co., Davenport, Iowa, asked that the word kiln be dropped from the vocabulary of the concrete products maker, as a kiln is generally used for a drying room. He also asked that his hearers recognize that concrete products are heavy, so any curing layout should reduce transportation to the minimum.

The steam curing rooms of the Cement Products Co. are four tunnels 4 ft. wide and 50 ft. long made of cement plaster on wire mesh. Live steam is admitted directly and this practice was adopted after trying out steam pipes in water. In summer water is sprayed into the room.

The speaker wanted to know why curing rooms were always built outside. Experience with the tunnels described showed that curing rooms should not be in an exposed situation which is bad in summer as well as in winter. Curing rooms should be designed for uniformity of both temperature and moisture regardless of weather conditions, so an exposed location is bad. Curing rooms should be in the plant under the roof. The space above such inside rooms is valuable for storage or other purposes.

Curing rooms should not be too high. The top blocks on the trucks should be just under the roof. Too high rooms accumulate moisture at the top.

The width should be such that there will be room for a man to pass when the room is full. Two tracks are enough in each room, as more makes the cost of supporting the roof over a long span expensive. A convenient length is 42 ft., which will take five full cars.

A good layout would put the machine room in the center and curing rooms on both sides.

Sprays, live steam from pipes and fog nozzles may be used for moistening the air, either singly or in combination. The curing rooms of the future will have recording thermometers and hygrometers. Steam pipes should be placed to heat the rooms in cold weather and the temperature should be kept at 100 deg. F. The humidity should be enough to keep the air from absorbing moisture from the blocks, but not enough to promote condensation which might sag the blocks. Ventilation should be provided to prevent this.

In a two-track room each track should have a door with a T-bar astrigal between. Plates are bolted to the edges of the doors. The bottom should not be closed except by a 1x4-in. strip nailed on that can be torn off in case of "freezing" without injury. "Tin-clad" doors, painted to preserve the metal, have been found satisfactory.

Reducing Cost of Manufacture

The paper of **C. J. Herzog**, of the General Cement Products Co., Pittsburgh, was on methods of reducing costs and it was listened to attentively because Mr. Herzog's company operates several plants and does a great deal of research work.

The grading of the aggregate used, Mr. Herzog said, had given the greatest opportunity for the reduction of the cost of manufacture. The rule was to use the coarsest aggregate that the *appearance* of the finished block would permit. It had been found profitable to include some limestone screenings in the complete aggregate to promote workability.

In three of the company's plants three aggregates were used and a great saving had been effected by a very close control of the fineness modulus of the mixed aggregate.

Appearance is a most important matter. Faced blocks imitating other materials are not good because they are imitations. Concrete can be sufficient in itself. For faced blocks there is a wide range of aggregates that will give a pleasing appearance. Color may be applied with sprays or otherwise, but the best method of giving color is to use portland cement stucco. Stucco should be plant mixed of dry materials and the grading of the sand used should be controlled.

There have been found to be many advantages from combinations of plants. The chief is the lowering of delivery costs. There are fewer salesmen required and the facilities for handling credits are better.

Applying Scientific Methods to Manufacturing

Benjamin Wilk, of the Standard Buildings Products Co., Detroit, Mich., spoke on the application of scientific methods to products manufacture.

Economical production, he said, starts with the design of the plant, and engineering principles should everywhere govern the design. The basis of design should be the number of machines required to supply the local demand.

Actual manufacturing costs may be divided into:

1. Cost of aggregates.
2. Cost of cement.
3. Cost of labor.
4. Cost of overhead.

1. The cost of aggregates may be lowered by placing the plant for easy delivery by rail. Truck delivery costs so much more that for ordinary distances the cost of aggregate per block may be 2 cents more than with railway delivery of aggregates.

2. Cost of cement is a matter of the number of blocks made per sack. Mr. Warford has told how, by careful grading of aggregate, he gets 22 blocks per sack. Other makers often get only 15 to 16 blocks per sack. Mr. Warford's blocks cost him 2½ cents for cement and the others cost 3½ cents.

But appearance counts heavily. In some places a smooth block is wanted and fine material is used for appearance which makes the cement cost higher.

Using limestone screenings pays. Screenings with 8% through 100 added to the mixture made a slumping block stand up. The fine limestone dust has a cementing value. Blocks made of one-third limestone screenings and two-thirds sand and pebbles were better than blocks made with either screenings or sand and pebbles alone. In one test there was considerable breakage with the sand and pebble aggregate, but no breakage when the aggregate contained limestone screenings.

Aggregates can be drawn from four bins to each mixer in the speaker's plant. The flow is controlled by slide gates and the mixer man soon learns to measure into the mixer by eye with sufficient accuracy. Water is added from a 15-gal. tank with a glass gage, the water being measured as it runs out. Five gallons per sack of cement is used, which is slightly on the wet side. Web marks show on the block.

3. Direct labor cost does not vary so much as people suppose. The speaker uses piece work payment. The good men prefer piece work and introducing it in his plant has increased production 50%.

4. Overhead is bound to vary with every plant. Each plant is a study in itself when reducing overhead is considered. Running part time is one of the things that runs up the overhead.

New Ideas of Manufacturing

Newton D. Benson, Providence, R. I., warned his hearers that his talk would contain some revolutionary ideas. The first of these was that a plant should make three products, block, brick and tile, instead of only one product. Three units keep the plant in more uniform operation and one product helps to sell the others.

The best location for a plant is near a gravel pit or other source of aggregate and on a railroad. The plant layout will be determined by the ground and if there is a grade advantage may be taken of it to transport materials or finished product by gravity.

The machines should be four in number or some multiple of four. There should be one machine for each product made and a spare fitted to replace any one of the others. Room must be left for making repairs and for storing pallets near machines. An empty car should be ready as soon as a car is filled and this means a continuous loop track. Belt conveyors between two machines running to cars make rapid handling. There must be one off-bearer to the belt and one to the car.

Long brick pallets may be moved on a conveyor made of two cables mounted on sheaves joined to run at the same speed.

Three different grades of coarse aggregate should be used; for block, pebbles up to 1-in.; for tile, pebbles up to ½-in., and for brick, up to ¼-in. Sand should be screened on a ⅛-in. or 1/10-in. screen and gravel on a ½-in. screen to make these sizes. If there is too much fine in the sand, part may be rejected and sold. It pays in saving cement to screen aggregates in this way and then recombine them.

Steam curing ordinarily requires the operation of a boiler for 24 hr. per day. If a 2% calcium chloride is used, curing will be sufficiently completed so that the boiler does not have to run all night.

The plant should have a schedule of production. An estimate of the number of each unit the market will take should be made and from this the number of days necessary should be allotted to each machine and the plant run steadily. This will run up the amount carried in stock, but it will save in labor turnover and avoid peaks and valleys in production.

A Pioneer Block Maker's Experiences

Lacy Petton of Benton, Ill., could not be present, so his paper was read by Mr. Wilk. Mr. Petton said he became interested in concrete blocks when he saw an Italian mason making them in 1901. Sand with just enough cement to stick it together was used and the mixture very lightly tamped in the mold by hand. A house made of these blocks let the rain filter through so that the plaster came off inside. Eventually by putting on a roof like an umbrella and painting the outside, the house was made habitable.

Mr. Petton was interested and thought he could make a better block that would really do to build a house of. His first plant had all hand-made equipment, even to the mixer. He tried to make a quality block but found he had to get 5c more than the sand blocks were bringing. Instead of tamping with 5-lb. or 6-lb. he used a 16-lb. tamper and made a better block and made it quicker.

Speaking of his present method, he would say that he did not know much about the water cement ratio, but he got results by telling the mixer man that he must see water marks on the blade side of the mixer. Splitting of blocks comes from too little water rather than too much. But men always want to decrease the water when things are not going right. Usually the trouble is from too little water rather than too much.

"Fineness modulus is another one of those boys with whom I am not well acquainted," said the paper. The mix used by its author was:

4½ cu. ft.	¼-in. to ⅝-in. pebbles.
4½ cu. ft.	¼-in. and finer sand.
1½ cu. ft.	Limestone screenings.
1 cu. ft.	Cement.

This gave 22 block to the bag of cement. Limestone screenings were added to promote workability. The concrete had a 28-d. strength of 1300 lb.

Mr. Petton stressed the value of having blocks properly laid and recommended the following mortar:

3 bags cement.
1 bbl. lime.
1 yd. sand.

This, he said, made a splendid mortar which allowed settlement to be taken up in the joints.

Making Wet Cast Stone

Making Onondaga Litholite

"MAKING Onondaga Litholite" was the subject of a paper by **Henry P. Warner**, president of the Onondaga Litholite Co., Syracuse, N. Y., which was read by W. Paul Eddy, treasurer of the company. The paper said that a universal mistake had been, that of introducing cast stone as a substitute for something when really it had merits enough of its own. Architects were thus taught to consider it on a cost basis. But its quality was being recognized now, so that it was used without regard for cost. It would be too expensive to use freely if cost of making could not be saved by casting a piece approximately to the required shape. One great advantage is that it can be used in larger pieces than would be practical with natural stone.

Drawings of the pieces required are first made to ½-in. or ¾-in. scale and approved by architect and contractor. From these templates are made. Each job has a card on which there is an isometric drawing of the piece with a schedule including every detail of the making. Lists are made and sent to the different departments. The pieces for the lower part of the building will be wanted first, so they must be made and shipped first. The production man keeps in touch with the progress of the work at both ends. Models are made at the factory and are approved by the architect. Modelers and cutters are kept on the job and the entire work may be done on the job if this is required, as it sometimes is.

Models are made of wood or wood and plaster, and if the pieces are to be cast in sand molds the pattern must "draw." Undercuts are taken care of by pieced patterns.

Aggregates are crushed and graded at the plant and a 1-3½ mix is used. The consistency is such that the mix will flow on a grade of 1 in. to 1 ft.

Exposed surfaces are all finished by cutting or tooling. Carborundum tooling wheels designed by the company's own engineer are used. Other stone cutting is the same as with natural stone, except that pneumatic chisels are employed.

The demand is so great that competition from responsible firms would actually be welcomed.

Casting Litholite

At another session **W. Paul Eddy** gave fuller details of the casting of Onondaga litholite, especially the method using sand molds. The practice is to use 8 gal. of water per sack of cement. The aggregate graded from three sizes (½-in. to ⅜-in. being the largest) is crushed marble.

Water is measured into the mix by using a tank with a glass gage. All mixing is by weight. Cement is first added to the aggregate and then the water and a 4-m. mix is given and then the concrete is transferred to an agitator tank where it is mixed continuously for at least 10 m.

A wet mix is used because it must flow into all the complicated parts of the mold and also so that it can flow through the valve of the agitator, which has been found to choke with a dryer mix. The mass is pasty and will just flow on a 1-in. grade.

The excess water filters through the sand of the mold before hardening begins and does not take any cement with it. This is shown by the fact that the sand is used over and over again and never sticks from being contaminated with cement. After setting 20 min. the concrete is hard enough to trowel.

The piece is allowed to remain from 48 hr. to 72 hr. in the mold and the sand that adheres when the mold is removed is not brushed off for two weeks.

The concrete tests between 5000 and 6000 lb. and has an absorption of about 3%—never more than 6%. Reference to the chart shows that this strength corresponds to a water-cement ratio of 3½ gal. to the 94-lb. sack. From this and from other determinations made, it is judged that 4½ gal. of water of the 8 gal. originally used filters out into the sand mold.

Casting and Finishing With Acid Treatment

"Why I Make Cut Cast Stone," was the subject of a paper by **Robert Havlik**, who is well known for the work he did at Mooseheart as well as for his present work. Mr. Havlik makes wet cast stone in glue molds and other molds, but he does not finish by cutting; he dips the pieces in a bath of muriatic acid, con-

tained in tanks 3x4x14 ft. and keeps them there until all the surface cement is etched off. Acid treatment of surfaces by brushing on and scrubbing with a wire brush is too expensive a method. Dipping is much cheaper because it requires less labor.

In his market (Chicago) Mr. Havlik comes in competition with Bedford limestone and terra cotta and price is an important factor in determining the material to be used.

He is firmly convinced that cut cast stone can be made satisfactorily only by the wet method. When he used dry tamping he did not get uniform results and often had to apologize for the appearance of a piece, which has never been necessary with wet cast pieces.

To bring out the surface rightly by acid-treating, the piece must be made of "100% concrete." Crown Point spar is used as aggregate as it resists the acid better than marble. The mix is 1:3 because it has been found that a richer mix is liable to hair-crack. Celite is used in plastering and facing. Steam curing is always used.

Mr. Havlik gave a demonstration of his methods aided by two of his men, both graduates of the Mooseheart school. They made a plaster model of a column by revolving against a template, explained the making of a glue mold and made a plaster cast in a glue mold. A freshly made concrete casting was acid treated and then passed through the audience so that the appearance could be judged.

Mr. Havlik agreed with Mr. Warner that much more cast stone than was made could be sold and said that he too would welcome intelligent competition.

Making "Art Marble"

"Art Marble" is the trade name of a wet cast concrete product made by the Chicago Art Marble Co. Its manufacture was described by **I. L. Stern** of the company. It is used extensively for floors, stair treads, soffits, panels and in other places where an ornamental stone would be used. The aggregate is marble, the hardest marble that can be found, and spalls and not chips are used. These are crushed at the plant, first in a jaw crusher and then in a gyratory crusher. The gyratory has been chosen as a finishing crusher because it makes more pieces with sharp edges and of the texture desired. Some marble dust is used in the mix, and color is added. The aggregate is exposed by rubbing the surface to a finish.

Each piece is made of a facing made as just described and a backing which is a dry mix of "torpedo" sand and limestone screenings with cement. The facing mixture is first placed in the mold and the mold is vibrated which compacts the mass and brings the excess water to the top. Then the backing mixture is added and the mold and contents are placed in a press and submitted to a considerable pressure.

Steam curing is not used as it has been found to affect the delicate colors used with the cement. The pieces are finished by grinding on rubbing beds and the sand scratches that show after bed rubbing are removed by rubbing with a fine stone.

The whole operation calls for close technical control to preserve the delicate colors employed and also to make a product which is uniform in every respect.

Color in Concrete

COLOR in concrete is a subject in which concrete products makers are more interested than those in other branches of the concrete industry so it was proper to have the paper of **Raymond Wilson,** of the Portland Cement Association, read at one of the products sessions. This paper described the tests with coloring materials which have recently been carried on by the association in its laboratory in Chicago. The paper was highly technical and went into a great deal of detail as to the methods of testing used, so that only an abstract and some of the conclusions can be given here.

The purpose of the tests was to discover the effect of the commonly used colors on the strength of concrete with and without some of the commonly used admixtures such as hydrated lime and Celite. The permanence of the colors was also investigated.

The colors included iron and other metallic oxides, chromium compounds, carbon black, coal, coke and two other organic colors, a red and a yellow. Both portland and white cement were used with sand as aggregate.

For exposure tests two disks were made one of which was exposed to the sun on the roof of the association building for a long period while the other was kept in the dark room of the laboratory. The two disks were then compared to determine:

Hue, which is the color itself. Five simple hues and five compound hues were recognized.

Value, which is the light reflecting quality of the piece.

Chroma, which is the intensity of the color.

The hue was determined by comparison with a revolving disk which was made up of three parts, each of a primary color. These could be set to overlap so as to change the color shown as a whole when the disk was revolving rapidly. The disk was changed until the color of the test piece was matched and the hue read off in terms of primary colors. Thus it might be found that a piece which had a reddish hue when it was first made had a yellowish hue after exposure to sunlight for some time.

Value was tested by comparison with a graduated scale running from black to white and the chroma by an optical device.

The most important change from exposure developed from these tests was a general weakening of the chroma or color intensity. The organic colors tested failed entirely from exposure and some others failed from chemical action.

It was determined that color should be specified in terms of cement rather than in terms of mortar.

Value was found to be affected by the amount of water used. The wet mixes appeared lighter than the dry mixes.

Hydrated lime had no bad effect on certain of the colors with which it was tested.

In the strength tests it was found that the addition of small amounts of pigment actually increased the strength in some cases; in others it decreased the strength. Carbon black reduced the strength, while iron oxide black increased it.

In general, it was determined that most of the cement colors found on the market had a satisfactory permanence. Organic compounds and calcium compounds were not found satisfactory. The strength of concrete is about the same with the usual pigments as without.

Considerable discussion followed led by John J. Early, of Washington, D. C., who said he thought the Institute was greatly indebted to Mr. Wilson for bringing such a much needed contribution to our information concerning concrete.

Maxmillian Toch, of Toch Bros., New York, spoke especially of ultramarine blue, of which he said there were more than 57 varieties ranging from good to very bad. He also said that there were organic colors which could be very successfully used in portland cement concrete.

Benjamin Wilk said there would be a tremendous market for an absolutely permanent color for face brick. He also mentioned that aluminum sulphate helped to hold colors in concrete.

Making Concrete Pipe

THERE were but two papers on concrete pipe making, one describing the centrifugal process, the other the manufacturing by the dry-tamp method with special reference to troubles that developed at certain seasons of the year.

Making Pipe by the Centrifugal Process

F. F. Longley of the Lock Joint Pipe Co., of Ampere, N. J., read the paper on pipe making by the centrifugal method. This was one of the various papers read which showed the possibility of mixing the concrete wet and then extracting the excess water before the setting period was well begun. The water is squeezed out as the material is compacted by centrifugal force and the excess water may be poured

out of the pipe as soon as the whirling is finished. All the remaining water is contained in the very small voids left in the compacted material. The entire process including the whirling which produces the centrifugal action takes from 10 to 15 min.

The original mixture is made wet so that it can flow freely in the mold. The interior wall of the pipe is not formed over a mandril but is nevertheless kept true and smooth by the centrifugal action.

The mixture used is a 1:2 mortar with 4⅔ gal. of water per sack of cement. This flows easily into the mold. From various methods of determination it has been calculated that all the water which remains after the centrifugal action has taken out the excess is sufficient for the hydration of the cement but no more.

The pipe walls retain their shape permanently after the centrifugal action is complete; hence the concrete has a true zero slump.

The weight of the finished concrete (dry) is from 163 lb. to 165 lb. per cubic foot. Compressive strengths run from 5000 to 7000 lb. per sq. in. after 28 days.

However, the centrifugal process has not been found to be the best under all conditions and for all sizes of pipe. Other qualities than strength are sometimes wanted in pipe. For this reason the centrifugal method is used by the Lock Joint Pipe Co. in making only the smaller sizes.

Trouble from Cracking in Dry-Tamped Pipe

A paper on dry-tamped pipe making by **George Chandler** of the Superior Products Co., Detroit, Mich., gave a very interesting experience in finding the cause of cracking in pipe made in the winter season and removing it. In Mr. Chandler's plant pipe are made in two ways. The larger sizes are made by hand-tamping a dry-mix product into molds; the smaller sizes are made by a machine in which centrifugal action is secured by using a revolving packer head. Pipes from 24-in. to 54-in. diameters were subject to the cracking mentioned.

The pipes when taken from the jacket appeared perfectly sound and were placed in the steam room for about three hours. Then steam was turned on and the room brought to a temperature of 110 deg. F. in which the pipe were cured for 48 hrs.

It was noted that circumferential cracks developed shortly after the pipe were placed in the curing room. This was thought to be due to volumetric changes but the reason for them had to be found by cut-and-try methods.

It was suggested that the cause of cracking might be changes of temperature from opening the doors, so this was tested. Curing at different temperatures was tried but no temperature changes improved matters. Finally a man was detailed to inspect the pipe regularly during the curing period but all that he discovered was that cracks developed in periods ranging from 5 to 10 hrs.

Being in the winter, the concrete was made from heated aggregates which were brought to a fairly high temperature by steam pipes. This heating was discontinued and pipes made of cold aggregates, which meant that a chance of including lumps of frozen aggregate had to be taken.

It was finally noted that pipe which had broken down in making and which had to be put through the machine again were free from cracks. This gave the idea that more time was needed before the concrete went from the mixer to the machine. To aid in this a 30-ft. mixer was installed in the place of the 14-ft. mixer in use and the concrete was held in it as long as the requirements of the plant would allow. This was found to cure the trouble from cracking. The present winter has been very severe at times in Detroit, but no trouble from cracking has been experienced. Better strengths have been found with the concrete held as described.

The pipes are of the bell and spigot type, the bell being formed by a bell-packer. The fineness modulus of the aggregate is from 3.5 to 4.5 and the water-cement ratio from 0.4 to 0.5 to 1. Jackets are removed as soon as the pipe is formed and the pipe has to be strong enough when this is done to stand the shocks of handling.

A wide variation in quality has been found in the use of different cements and a further variation from the length of time the pipe remains in the machine. Pipes which have to be broken up and put through the machine again show greater adhesive qualities than when first made.

Little enough is known of concrete made from dry-tamping mixes and the whole matter is suggested as a field for investigation.

Reports of Committees

Report of Committee on the Effect of Fineness Modulus

COMMITTEE P-1, **E. W. Dienhart**, chairman, made a series of tests on the effect of combining different sands and pebbles in different proportions but always to produce the same fineness modulus in the complete aggregates. The resulting blocks were tested for strength and absorption.

The sands used had a F. M. of 2.00 to 3.50 and were used in mixtures containing from 64 to 100% sand all of which had a F. M. of 3.5. Another set of mixtures, all of which had a F. M. of 4.00 was made and these contained from 52 to 82% of sand. All conditions of manufacture were the same for all blocks, and no account was made of the water used as the purpose of the tests was to determine strengths and absorption for the same plasticity or machinable condition.

The committee's conclusions are:

1. In these tests, aggregates having the same fineness moduli produced building tile of essentially the same strength with other manufacturing details constant. Identical fineness moduli were obtained through the use of a coarse aggregate combined with four different sands with fineness moduli varying from 2.00 to 3.50. In all cases, the 28-day strength of the building tile varied from the average 15 per cent or less with the same fineness modulus of different gradings for the same mixture. The variation is small considering that only one batch was used to represent each condition.
2. In general, building tile having the greater compressive strength was less absorbent and was composed of concrete having a higher weight per cubic foot.
3. The necessity of closely regulating the amount of water used in manufacture of dry-tamped products is shown by Batch 1. This batch produced tile of good appearance, but was somewhat drier than subsequent batches, resulting in a reduction of strength of 40 per cent from the average of the other tile in this group, with an increase of absorption of 1.8 per cent.

Report of Committee on Plant Operation

Committee P-6, on plant operation, **Benjamin Wilk**, chairman, gave a very full and detailed report on a long series of tests made to show the effect of outdoor curing under weather conditions for an entire year. The work was done in St. Paul where the temperature changes range about as widely as in any portion of the United States. The report is very long and contains many tables. As these hold much that is interesting beside the results of curing, the paper will be published in more detail in another issue.

Little difference was found in blocks cured 24 hrs. in a moist room at 70 deg. and in a steam room at 110 to 125 deg. F. for the first 24 hrs., but block cured in the moist room were 3% stronger at 28 and 90 days.

The lowest strengths were obtained from block made in the winter and spring.

The widest range in strength based on the gross area strengths for the two initial curing conditions was 205 lb. at 28 days and 295 lb. for 90 days. These ranges are 28 and 30% respectively, of the grand average of all blocks at this age.

For both initial conditions of curing the strength of the block at 90 days was 11% greater than the strength at 28 days.

The greatest strengths were obtained for the months having the highest temperatures during which the air contained the most water vapor and in which the rainfall was greatest.

Cement Products Manufacture in 1925

Census Data Collected by Department of Commerce

THE Department of Commerce announces that, according to data collected at the biennial census of manufactures taken in 1926, the establishments engaged primarily in the manufacture of concrete products reported, for 1925, a total output valued at $75,213,986. The principal products of this industry are cement and concrete building blocks, pipe, tile, etc., made from crushed rock, gravel or sand, bound together with cement.

The leading items which contributed to the above total are as follows: Block and tile, 4,183,945 tons, valued at $31,193,535; cast stone, 354,165 tons, $12,843,418; large sewer pipe, 400,182 tons, $5,160,009; culvert pipe, 349,389 tons, $4,480,831.

In addition to the data reported by establishments classified in this industry for census purposes (establishments engaged primarily in the manufacture of concrete products and having a total output valued at $5000 or more), returns were obtained from 1101 other establishments—manufacturers of cement products whose output was valued at less than $5000, and building and contracting concerns. The total value of the concrete products manufactured by these establishments was reported as $3,332,529.

Of the 1666 establishments in the industry proper, reporting for 1925, 124 were located in California, 87 in Florida, 128 in Illinois, 75 in Indiana, 45 in Iowa, 40 in Maryland, 42 in Massachusetts, 94 in Michigan, 85 in Minnesota, 88 in New Jersey, 136 in New York, 134 in Ohio, 161 in Pennsylvania, 77 in Wisconsin and the remainder in 30 other states and the District of Columbia.

The figures for 1925, as presented herewith, are preliminary and subject to such correction as may be found necessary upon further examination of the returns. As the statistics for 1923 are not strictly comparable with those for 1925, they are not included in this report. The canvass for 1923 was restricted to establishments

TABLE 3. SUMMARY FOR THE INDUSTRY, BY STATES, AND FOR SELECTED CITIES, 1925

	No. of establishments	Wage earners (average number)*	Wages	Cost of materials	Value of products	Horsepower
United States	1,666	14,722	$20,761,376	$27,792,116	$75,213,986	37,748
States						
Alabama	8	103	89,660	195,592	564,847	160
Arizona	4	29	27,862	48,165	130,931	25
California	124	1,524	2,266,700	2,664,022	8,101,227	2,485
Colorado	17	138	171,583	250,485	927,478	640
Connecticut	21	613	920,758	381,962	1,920,197	604
Delaware	3	24	42,066	48,738	125,473	32
Dist. of Columbia	4	99	127,872	213,982	593,390	298
Florida	87	921	1,146,328	1,879,711	4,499,457	1,254
Georgia	10	74	67,075	109,978	313,045	124
Illinois	128	991	1,535,060	1,850,511	5,520,013	2,367
Indiana	75	566	896,344	1,801,503	4,164,939	2,107
Iowa	45	194	197,769	435,583	970,248	1,247
Kansas	24	129	167,458	248,602	789,223	501
Kentucky	11	95	115,695	206,189	479,962	210
Louisiana	9	98	95,665	177,625	434,771	119
Maine	4	18	20,261	27,405	62,356	150
Maryland	40	288	324,128	480,000	1,280,047	859
Massachusetts	42	556	995,279	796,978	2,779,698	936
Michigan	94	732	1,190,168	1,660,838	3,935,325	1,941
Minnesota	85	446	518,832	906,277	2,235,648	2,176
Mississippi	3	29	18,619	18,756	88,769	15
Missouri	21	189	278,745	363,104	1,142,648	430
Nebraska	27	206	248,345	457,628	1,123,559	403
New Hampshire	3	9	10,821	15,444	42,228	35
New Jersey	88	870	1,178,131	1,801,669	4,619,519	1,493
New York	136	1,377	2,573,022	2,287,975	7,173,708	5,130
North Carolina	15	197	146,142	310,911	680,673	397
North Dakota	3	7	6,359	14,427	33,319	24
Ohio	134	868	1,229,532	1,617,188	4,155,773	1,980
Oregon	19	145	217,956	269,950	837,568	904
Pennsylvania	161	1,427	1,907,397	3,249,979	7,449,392	4,085
Rhode Island	9	34	53,215	54,760	166,709	119
South Carolina	4	45	34,514	89,717	174,634	123
South Dakota	9	36	36,929	70,720	186,504	99
Tennessee	10	199	181,281	364,600	877,551	281
Texas	29	322	357,076	369,334	1,114,880	672
Virginia	15	261	237,925	327,568	965,900	641
Washington	32	208	281,066	353,004	1,040,896	441
West Virginia	21	169	147,627	279,886	607,486	581
Wisconsin	77	418	632,042	943,083	2,528,040	1,492
Other states†	15	68	68,069	148,267	375,955	168
Cities						
Mobile, Ala.	3	30	20,796	27,744	89,052	37
Los Angeles, Calif.	33	384	663,717	432,186	2,095,494	432
San Francisco, Calif.	4	86	180,842	82,381	405,570	185
Oakland, Calif.	4	16	17,236	36,073	86,841	15
San Diego, Calif.	6	32	38,487	57,937	159,212	12
Denver, Colo.	7	114	152,817	216,222	847,170	568
New Haven, Conn.	5	86	130,171	93,933	367,626	134
Bridgeport, Conn.	4	33	24,270	45,610	113,848	30
Washington, D. C.	4	99	127,872	213,982	593,390	298
Jacksonville, Fla.	6	188	223,572	211,369	712,130	119
Tampa, Fla.	10	172	158,864	350,810	788,157	388
Miami, Fla.	22	206	373,124	711,036	1,504,784	305
St. Petersburg, Fla.	10	160	172,627	179,655	459,782	150
Atlanta, Ga.	4	40	40,168	73,468	193,233	76
Chicago, Ill.	21	185	339,789	363,463	1,201,207	331
Peoria, Ill.	3	16	24,065	40,504	108,775	64
Springfield, Ill.	3	25	27,004	62,474	121,360	28
Aurora, Ill.	3	36	53,100	46,859	106,095	27
Forest Park, Ill.	4	52	98,572	125,458	353,050	62
Indianapolis, Ind.	11	77	110,694	158,712	412,245	270
Evansville, Ind.	5	26	21,100	46,733	93,631	37
South Bend, Ind.	3	14	19,295	24,252	61,045	33
Gary, Ind.	3	10	10,925	31,504	75,330	18
Kokomo, Ind.	3	4	4,325	8,987	26,311	22
Elkhart, Ind.	4	5	9,185	18,490	39,351	14
Des Moines, Iowa	3	10	10,423	15,656	36,287	37
Sioux City, Iowa	3	17	17,501	26,783	64,606	31
Cedar Rapids, Iowa	3	12	14,800	36,134	87,604	17
Waterloo, Iowa	4	17	16,346	36,097	92,269	83
Council Bluffs, Iowa	3	24	18,351	122,161	190,630	49
Kansas City, Kans.	3	32	53,905	61,876	214,159	63
Wichita, Kans.	9	56	70,244	97,972	369,549	336
Louisville, Ky.	4	42	45,869	90,855	203,952	64
New Orleans, La.	4	66	58,670	93,330	268,180	99
Baltimore, Md.	20	203	228,027	309,920	908,000	417
Boston, Mass.	6	290	537,125	321,573	1,240,943	431
Springfield, Mass.	5	32	54,864	105,436	335,980	167
Detroit, Mich.	18	394	742,874	968,443	2,281,250	850
Gr'd Rapids, Mich.	3	14	13,290	31,365	63,400	18
Flint, Mich.	3	21	27,345	30,491	69,212	56
Saginaw, Mich.	7	49	53,934	121,975	220,552	114
Lansing, Mich.	3	24	30,272	49,279	136,001	58
Jackson, Mich.	3	8	13,536	17,961	44,221	19
Port Huron, Mich.	3	8	12,152	12,904	31,798	15
Minneapolis, Minn.	17	91	129,448	236,087	564,940	352
St. Paul, Minn.	11	72	92,020	164,886	398,493	171
Duluth, Minn.	8	49	63,356	112,395	245,822	80
Mankato, Minn.	3	36	32,884	40,303	94,243	505
St. Louis, Mo.	5	88	152,931	122,257	523,895	235
St. Joseph, Mo.	3	13	14,950	28,127	59,101	41
Omaha, Neb.	10	117	136,845	276,085	674,892	156
Lincoln, Neb.	3	35	46,680	72,973	187,100	48
Grand Island, Neb.	3	15	20,392	33,009	75,382	25
Newark, N. J.	3	66	93,997	249,912	580,862	158
Union City, N. J.	3	43	71,342	50,656	197,158	7
Irvington, N. Y.	3	49	64,157	138,049	348,598	28
New York, N. Y.	52	320	679,940	806,825	2,341,180	1,063
Buffalo, N. Y.	13	110	167,209	293,283	664,744	217
Rochester, N. Y.	6	210	364,986	318,572	846,514	255
Albany, N. Y.	3	20	23,327	72,832	143,750	33
Kingston, N. Y.	3	12	12,008	13,792	51,146	15
Cleveland, Ohio	13	118	168,105	245,207	521,784	221
Cincinnati, Ohio	6	47	61,946	62,803	187,438	101
Toledo, Ohio	8	56	90,470	140,968	355,917	204
Columbus, Ohio	4	44	65,457	164,169	313,441	90
Akron, Ohio	4	40	55,084	79,732	197,517	53
Youngstown, Ohio	3	15	26,172	27,598	76,951	55
Marion, Ohio	3	4	3,615	15,146	29,704	7
Elyria, Ohio	3	12	18,801	28,702	71,399	31
Portland, Ore.	10	86	143,701	153,422	475,295	138
Philadelphia, Penn.	9	277	366,017	700,182	1,556,434	454
Pittsburgh, Penn.	9	64	91,669	155,650	381,526	303
Erie, Penn.	5	17	30,785	53,485	125,501	159
Allentown, Penn.	3	121	175,449	158,941	482,663	125
Johnstown, Penn.	6	30	41,113	86,682	162,322	105
Providence, R. I.	5	22	34,896	37,740	111,074	84
San Antonio, Tex.	5	71	88,858	47,324	200,539	46
Dallas, Tex.	4	50	63,823	36,797	138,816	25
Norfolk, Va.	4	46	44,255	54,268	147,493	87
Seattle, Wash.	8	88	127,256	98,449	374,070	61
Spokane, Wash.	4	13	15,985	33,601	93,416	82
Tacoma, Wash.	8	23	30,470	31,707	97,144	79
Charleston, W. Va.	3	9	12,557	24,044	48,169	22
Parkersb'g, W. Va.	3	11	13,711	28,985	56,949	47
Morgant'n, W. Va.	3	12	10,461	10,950	35,311	17
Milwaukee, Wis.	15	146	249,392	324,880	915,828	263
Fond du Lac, Wis.	4	9	10,864	18,438	46,231	24
Eau Claire, Wis.	3	9	9,321	9,017	31,105	16
Appleton, Wis.	3	8	12,520	24,779	52,237	23
West Allis, Wis.	3	18	23,102	37,849	87,729	28

*Not including salaried employees.

†Arkansas, Odaho, Oklahoma, Utah and Wyoming.

classified as manufacturers of concrete products, whereas the 1925 inquiry covered contractors, builders, etc., manufacturing such products in connection with other activities. The statistics for 1925, consequently, represent a broader field than those for 1923.

TABLE I. SUMMARY FOR THE INDUSTRY FOR THE UNITED STATES, 1925

Number of establishments	1,666
Wage earners (average number)*	14,722
Maximum month (July)	16,562
Minimum month (January)	11,024
Per cent of maximum	66.6
Wages†	$20,761,376
Cost of materials (including fuel, electric power and mill supplies)†	27,792,116
Value of products†	75,213,986
Value added by manufacture‡	47,421,870
Horsepower	37,748

*Not including salaried employees.

†The amount of manufacturers' profits cannot be calculated from the census figures, for the reason that no data are collected in regard to a number of items of expense, such as interest on investment, rent, depreciation, taxes, insurance and advertising.

‡Value of products less cost of materials.

TABLE 2. CONCRETE PRODUCTS, BY KIND, QUANTITY AND VALUE, FOR THE UNITED STATES, 1925

Kind	Number of establishments	Tons	Value
Concrete products, total	*2,767	6,628,367	*$78,546,515
Block and tile	2,029	4,183,945	31,193,535
Brick	324	263,858	2,532,246
Cast stone	262	354,164	12,843,418
Roofing tile	†85	116,555	†3,538,601
Art marble floor tile	18	5,157	801,279
Concrete lumber and specials	5	731	23,324
Garden furniture	215	4,860	467,173
Garbage boxes	13	2,361	128,095
Laundry trays	42	60,455	1,620,920
Septic tanks and sanitary fittings	123	13,804	434,584
Flush tanks	6	202	8,958
Vaults and caskets	270	34,529	1,681,853
Monuments and grave markers	51	2,245	92,794
Large sewer pipe	109	400,182	5,160,009
Machine-made pipe	64	261,813	3,617,445
Pressure pipe	10	46,503	1,832,673
Culvert pipe	165	349,389	4,480,831
Irrigation pipe	73	138,806	1,783,874
Drain tile	163	79,919	704,033
Electric conduits	5	1,857	43,762
Meter boxes	19	4,960	138,425
Fence posts	87	7,540	146,736
Lighting standards	10	13,776	1,171,620
Staves and slabs	73	49,409	684,028
Silo blocks	41	24,043	517,179
Cistern and manhole blocks	58	27,940	223,199
Crossing slabs	9	1,223	17,107
Precast sidewalk slabs and curbing	42	22,229	296,003
Precast units for railroad uses	8	4,943	109,656
Mail-box posts, transmission and trolley poles	4	6,181	20,979
All other cement-products‡	293	144,787	2,232,176

*The difference between the number of establishments and the value of products as shown in this table and in Table 1 is accounted for by the fact that Table 1 was compiled from data reported by regular manufacturers of cement products whose output during the census year was valued at $5,000 or more; whereas Table 2 includes, in addition, data reported by manufacturers whose annual output was valued at less than $5,000, and by builders and contractors. The value of certain miscellaneous non-cement products made by concrete products manufacturers is included in the total value of products as given in Table 1, but not in the total shown in Table 2.

†In addition, cement roofing tile (made of cement, sand and coloring materials) valued at $476,075 was reported by 14 establishments classified in the industry designated as "Roofing materials, not including wood, slate, burnt tile, ashestos, or metal other than metal shingles and ceilings."

‡Head gates, incinerators, lintels, vents, chimney bases and frames, terrazzo steps, piers, weir boxes, mantels, grease traps, grave copings, water tanks, well curbing, sills, battery boxes, troughs, marble mosaic, etc.

Table III on the first page presents data for all states for which separate figures can be given without disclosing the operations of individual establishments. Certain of "other states," however, reported larger values of products than some of the states shown separately. The cities in this table are grouped by states and within each state are listed according to the number of inhabitants as enumerated at the census of 1920. Some of the cities for which statistics are given are less important in the concrete products industry than certain other cities for which separate statistics cannot be given without disclosing the operations of individual establishments.

Table IV below presents statistics for all states for which separate figures can be given without disclosing the operations of individual establishments. Certain of the "other states," however, reported larger values of products than some of the states shown separately. (See footnote *, Table 2.)

TABLE 4. CONCRETE PRODUCTS, BY KIND, QUANTITY AND VALUE, BY STATES, 1925

Kind	Number of establishments	Tons	Value
Block and Tile			
Total	2,029	4,183,945	$31,193,535
Alabama	5	15,748	118,257
Arizona	4	4,445	38,314
California	40	64,847	548,589
Colorado	6	5,299	75,278
Connecticut	10	10,708	75,281
Dist. of Columbia	5	24,674	259,391
Florida	80	246,747	2,312,166
Georgia	4	2,146	15,872
Illinois	228	268,549	1,894,614
Indiana	129	196,720	1,211,289
Iowa	118	63,076	460,633
Kansas	27	33,347	219,436
Kentucky	16	47,435	338,649
Maine	7	1,386	13,835
Maryland	47	82,462	695,907
Massachusetts	40	120,298	1,067,016
Michigan	141	375,965	2,404,850
Minnesota	105	238,041	1,159,959
Missouri	20	41,612	452,108
Nebraska	35	95,577	781,848
New Hampshire	6	1,563	15,347
New Jersey	82	322,357	2,661,048
New York	150	455,366	3,416,278
North Carolina	14	11,990	93,822
North Dakota	5	4,317	32,416
Ohio	236	423,535	2,942,764
Oklahoma	15	6,494	41,060
Oregon	16	8,596	108,927
Pennsylvania	190	603,907	4,783,017
Rhode Island	10	16,593	144,536
South Dakota	10	6,067	46,750
Tennessee	13	15,703	137,483
Texas	18	15,919	114,747
Virginia	15	29,682	286,998
Washington	21	21,218	199,875
West Virginia	23	31,121	260,637
Wisconsin	127	260,912	1,687,047
Other states[1]	11	9,523	77,491
Cement Brick			
Total	324	263,858	$2,532,246
California	12	1,230	27,120
Florida	17	16,348	232,251
Illinois	23	3,389	21,619
Indiana	10	753	6,099
Iowa	21	3,419	22,260
Kansas	3	102	745
Kentucky	4	1,042	12,912
Maine	7	878	8,384
Maryland	4	30,044	213,262
Massachusetts	7	3,112	29,066
Michigan	19	3,344	21,692
Minnesota	18	1,186	8,977
New Jersey	24	7,807	58,158
New York	17	16,531	120,875
Ohio	20	2,751	22,304
Oregon	10	8,032	81,415
Pennsylvania	27	86,515	1,184,561
Texas	4	826	5,102
Washington	7	3,034	43,760
Wisconsin	30	21,745	159,456
Other states[2]	40	51,770	272,228
Cast Stone			
Total	262	354,164	$12,843,418
California	27	30,770	1,327,555
Connecticut	8	33,707	1,552,238
Florida	12	19,913	901,822
Illinois	26	3,333	113,679
Indiana	8	841	31,615
Iowa	10	1,361	32,018
Kansas	8	6,854	262,956
Maryland	6	3,713	131,858
Massachusetts	6	46,742	1,560,340
Michigan	14	26,726	785,733
Minnesota	4	2,467	57,778
Nebraska	5	97	3,402
New Jersey	8	5,696	307,596
New York	17	44,058	2,522,387
Ohio	21	20,936	760,422
Oregon	4	1,658	118,006
Pennsylvania	21	34,860	635,121
Tennessee	5	6,479	197,094
Texas	9	27,822	390,845
Wisconsin	12	3,835	101,134
Other states[3]	31	32,296	1,049,819
Roofing Tile			
Total	85	116,555	$3,538,601
Alabama	3	3,044	104,771
California	11	13,469	194,541
Florida	7	1,369	62,103
Illinois	10	27,712	614,126
New Jersey	8	10,286	398,595
New York	4	768	26,292
Pennsylvania	5	7,543	210,005
Texas	5	1,077	45,361
Virginia	4	2,172	43,342
Other states[4]	28	49,115	1,839,465
Art Marble Floor Tile			
Total	18	5,157	$801,279
California	6	1,345	173,535
Illinois	3	2,038	194,350
Other states[5]	9	1,774	433,394
Concrete Lumber and Specials			
Total[6]	5	732	$23,324
Garden Furniture			
Total	215	4,860	$467,173
Alabama	3	113	9,022
California	11	375	59,401
Florida	12	212	17,145
Illinois	25	278	28,855
Indiana	8	140	9,357
Iowa	17	79	6,872
Massachusetts	5	26	2,513
Michigan	14	83	7,622
Minnesota	5	67	6,264
Nebraska	5	48	4,121
New Jersey	9	256	24,114
New York	8	961	91,525
Ohio	17	213	11,665
Texas	6	53	4,765
Washington	5	37	3,102
Other states[7]	65	1,919	180,830
Garbage Boxes			
Total	13	2,361	$128,095
Illinois	5	1,313	52,976
Other states[8]	8	1,048	75,119
Laundry Trays			
Total	42	60,455	$1,620,920
California	8	6,221	195,868
Illinois	4	12,449	342,566
Massachusetts	3	1,189	52,671
New York	3	5,980	127,556
Ohio	3	8,271	143,367
Washington	3	842	30,588
Other states[9]	18	25,503	728,304
Septic Tanks and Sanitary Fittings			
Total	123	13,804	$434,584
California	9	1,038	12,682
Connecticut	4	1,398	69,616
Florida	10	3,507	132,875
Illinois	8	832	24,800
Iowa	6	208	5,857
Michigan	5	90	3,347
New York	5	299	10,493
North Carolina	3	765	39,681
Ohio	12	345	15,314
Oregon	4	137	4,240
Pennsylvania	13	2,590	43,050
Washington	12	549	16,715
Other states[10]	32	2,046	55,914
Flush Tanks			
Total[11]	6	202	$8,958
Vaults and Caskets			
Total	270	34,529	$1,681,853
Alabama	3	527	27,351
California	7	587	31,320
Connecticut	3	673	45,523
Georgia	5	712	23,078
Illinois	36	8,496	322,727
Indiana	29	3,633	188,651
Iowa	26	802	51,418
Michigan	22	2,002	99,781
Nebraska	9	619	32,182
New Jersey	6	2,468	175,643
New York	15	2,999	183,639
Ohio	29	2,206	101,926
Pennsylvania	23	3,811	171,752
Virginia	5	878	23,980
Washington	4	281	14,243
Wisconsin	16	556	31,996
Other states[12]	32	3,279	156,643

	Number of establishments	Tons	Value
Monuments and Grave Markers			
Total	51	2,245	$92,794
Illinois	8	306	11,315
Iowa	7	59	3,004
Texas	4	85	3,250
Wisconsin	7	85	3,662
Other states[13]	25	1,710	71,563
Large Sewer Pipe			
Total	109	400,182	$5,160,009
California	7	94,376	1,514,703
Colorado	6	5,430	78,549
Connecticut	3	4,723	62,294
Georgia	3	6,590	35,625
Illinois	7	21,495	242,298
Maryland	3	13,410	144,348
Minnesota	4	12,726	162,499
New Jersey	10	33,015	374,698
New York	8	18,168	243,277
North Carolina	4	20,764	190,394
Oregon	4	5,443	96,304
Pennsylvania	5	5,229	62,728
Texas	7	6,962	80,729
Washington	7	7,853	100,116
Other states[14]	31	143,998	1,771,447
Machine-Made Pipe			
Total	64	261,813	$3,617,445
California	17	71,114	1,041,285
Florida	4	40,175	567,017
Louisiana	3	20,187	268,590
Michigan	3	32,253	296,824
Oregon	6	6,250	115,856
Washington	8	8,636	145,206
Other states[15]	23	83,198	1,182,667
Pressure Pipe			
Total [16]	10	46,503	$1,832,673
Culvert Pipe			
Total	165	349,389	$4,480,831
Florida	5	15,626	218,378
Georgia	3	4,137	60,146
Illinois	8	25,705	352,821
Iowa	12	16,018	187,475
Kansas	9	9,948	145,265
Louisiana	3	6,272	93,965
Minnesota	12	22,623	277,785
Missouri	4	7,301	86,300
Nebraska	6	5,442	81,357
New Jersey	5	18,407	262,578
New York	8	11,938	169,895
North Carolina	7	22,669	205,625
Oklahoma	4	5,308	58,411
Oregon	8	7,543	161,253
South Dakota	3	7,500	78,784
Texas	7	7,691	117,463
Virginia	4	10,489	107,962
Washington	13	14,287	252,086
West Virginia	3	21,945	155,960
Other states[17]	41	108,540	1,407,322
Irrigation Pipe			
Total	72	138,806	$1,783,874
California	52	121,659	1,551,272
Colorado	3	524	6,587
Oregon	4	1,618	33,207
Washington	3	2,583	45,736
Other states[18]	10	12,422	147,072
Drain Tile			
Total	163	79,919	$704,033
California	6	1,568	22,087
Florida	5	700	10,243
Illinois	15	5,947	52,312
Indiana	17	6,311	53,178
Iowa	14	8,208	67,916
Michigan	7	1,669	14,984
Minnesota	29	27,551	203,059
North Carolina	5	1,389	13,008
Ohio	15	5,305	42,152
Oregon	9	1,997	27,252
Texas	3	1,534	5,880
Virginia	3	141	2,278
Washington	9	2,710	27,554
Wisconsin	9	5,453	70,266
Other states[19]	17	9,436	91,864
Electric Conduits			
Total[20]	5	1,857	43,762
Meter Boxes			
Total	19	4,950	$138,425
California	3	3,737	107,664
Other states[21]	16	1,223	30,761
Fence Posts			
Total	87	7,540	$146,736
Florida	3	61	2,150
Illinois	10	133	4,626
Indiana	7	100	1,658
Iowa	6	63	992
New York	6	1,574	17,704
Pennsylvania	4	113	2,398
Washington	6	611	11,622
Other states[22]	45	4,885	105,586
Lighting Standards			
Total[23]	10	13,776	$1,171,620
Staves and Slabs			
Total	73	49,409	$684,028
Illinois	6	9,352	98,677
Indiana	9	9,847	91,393
Iowa	12	5,794	150,420
Michigan	5	1,902	56,696
Minnesota	14	5,177	59,513
Ohio	5	11,144	135,966
Wisconsin	6	2,755	33,188
Other states[24]	16	3,438	58,175
Silo Blocks			
Total	41	24,043	$517,179
Kansas	4	4,861	112,426
Michigan	4	442	5,617
Wisconsin	10	6,938	227,315
Other states[25]	23	11,802	171,821
Cistern and Manhole Blocks			
Total	58	27,940	223,199
Illinois	19	19,391	173,193
Minnesota	5	84	674
New Jersey	3	1,067	5,498
Ohio	5	170	1,244
Wisconsin	5	168	1,608
Other states[26]	21	7,060	40,982
Crossing Slabs			
Total	9	1,223	$17,107
Minnesota	4	137	1,362
Other states[27]	5	1,086	15,745
Precast Sidewalk Slabs and Curbing			
Total	42	22,229	$296,003
Florida	4	6,071	83,675
Illinois	3	390	8,816
Ohio	5	537	7,438
Pennsylvania	4	417	2,236
Other states[28]	26	14,841	193,838
Precast Units for Railroad Uses			
Total	8	4,943	$109,656
Minnesota	3	2,588	41,462
Other states[29]	5	2,355	68,194
Mail-Box Posts, Transmission and Trolley Poles			
Total[30]	4	6,181	$20,979
All Other Cement Products			
Total	293	144,787	$2,232,176
California	26	15,049	394,570
Colorado	6	248	3,431
Florida	11	1,535	32,818
Illinois	24	15,729	410,536
Indiana	10	10,151	14,363
Iowa	18	2,021	19,221
Maryland	6	909	32,089
Michigan	16	1,620	24,369
Minnesota	19	1,090	14,864
Nebraska	7	3,213	50,969
New Jersey	12	3,826	185,825
New York	14	10,244	267,466
Ohio	21	5,430	49,348
Oregon	8	406	9,090
Pennsylvania	20	2,195	24,941
Rhode Island	4	761	11,460
Texas	8	5,440	65,672
Virginia	4	377	7,755
Washington	10	1,617	29,706
Wisconsin	19	3,689	236,797
Other states[31]	30	68,237	346,886

[1]Arkansas, Delaware, Idaho, Louisiana, Nevada, Utah and Vermont.

[2]Alabama, Arizona, Arkansas, Connecticut, District of Columbia, Georgia, Idaho, Missouri, Montana, Nebraska, New Hampshire, North Carolina, Oklahoma, Rhode Island, South Dakota, Tennessee, Vermont and Virginia.

[3]Alabama, Colorado, Delaware, District of Columbia, Georgia, Idaho, Kentucky, Louisiana, Maine, Mississippi, Missouri, North Carolina, Oklahoma, Utah, Virginia, Washington and West Virginia.

[4]Arkansas, Colorado, Connecticut, Georgia, Indiana, Iowa, Louisiana, Massachusetts, Minnesota, Mississippi, Missouri, North Carolina, Ohio, Oklahoma, Oregon, Tennessee and Washington.

[5]Alabama, Delaware, Florida, Michigan, New York, Ohio and Oregon.

[6]California, Indiana, Pennsylvania and Rhode Island.

[7]Arkansas, Colorado, Connecticut, Delaware, District of Columbia, Georgia, Idaho, Kansas, Kentucky, Louisiana, Maine, Maryland, Mississippi, Missouri, New Hampshire, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, Rhode Island, Tennessee, Virginia and Wisconsin.

[8]Connecticut, Florida, Maryland, Michigan, New Jersey, North Dakota and Pennsylvania.

[9]Connecticut, Florida, Kansas, Maryland, Michigan, Minnesota, Nebraska, New Jersey, Oregon, Pennsylvania, West Virginia and Wisconsin.

[10]Alabama, Colorado, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Oklahoma, South Dakota, Tennessee, Texas, Virginia and Wisconsin.

[11]California, Illinois, Iowa, Tennessee and Washington.

[12]Colorado, Delaware, Florida, Kansas, Maine, Maryland, Massachusetts, Minnesota, Missouri, Montana, New Hampshire, North Carolina, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Utah and West Virginia.

[13]Alabama, California, Delaware, Georgia, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Virginia and Washington.

[14]Alabama, Arkansas, Florida, Indiana, Iowa, Kansas, Louisiana, Massachusetts, Maine, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, Ohio, South Carolina, South Dakota, Tennessee, Virginia, West Virginia and Wisconsin.

[15]Arizona, Arkansas, Colorado, Connecticut, Georgia, Idaho, Iowa, Missouri, Montana, Nebraska, New Jersey, New York, Oklahoma, Pennsylvania, Tennessee, Texas, Virginia, West Virginia and Wisconsin.

[16]California, Colorado, District of Columbia, Illinois, New Jersey, Texas and Washington.

[17]Alabama, Arkansas, California, Idaho, Indiana, Kentucky, Maine, Michigan, Mississippi, New Hampshire, North Dakota, Ohio, Pennsylvania, South Carolina, Tennessee, Utah and Wisconsin.

[18]Arizona, Florida, Idaho, Illinois, Iowa, Oklahoma, Rhode Island and Texas.

[19]Kansas, Kentucky, Maryland, Mississippi, Missouri, Nebraska, Nevada, New Jersey, New York, Pennsylvania, South Carolina, South Dakota and Utah.

[20]California, Illinois, North Carolina and Ohio.

[21]Illinois, Indiana, Kansas, Nebraska, North Carolina, Oregon, South Dakota, Tennessee, Utah and Washington.

[22]Alabama, Arkansas, Connecticut, Georgia, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, North Carolina, Ohio, Oregon, Tennessee, Virginia and Wisconsin.

[23]California, Florida, Illinois, Iowa, Missouri, Washington and Wisconsin.

[24]California, Colorado, Kansas, Louisiana, Montana, New Jersey, New York, Pennsylvania, South Dakota, Tennessee and Texas.

[25]Illinois, Indiana, Iowa, Minnesota, Missouri, Ohio, Oklahoma, South Dakota, Virginia and Washington.

[26]California, Colorado, Indiana, Iowa, Massachusetts, Michigan, Missouri, Nebraska, New York, South Dakota, Texas and Washington.

[27]Missouri, Nebraska, North Dakota, Ohio and Washington.

[28]Alabama, Connecticut, Idaho, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, North Carolina, Texas, Virginia and Wisconsin.

[29]Florida, Illinois, New York and Ohio.

[30]Illinois, Missouri and New Jersey.

[31]Alabama, Arizona, Arkansas, Connecticut, Georgia, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Missouri, Nevada, North Carolina, North Dakota, Oklahoma, South Dakota, Tennessee and West Virginia.

Keystone Phosphate Company Plans Expansion

EXPORT of phosphate from Portland to Japan by the Keystone Phosphate Co., Portland, and Paris, Idaho, will start within 60 days, according to an announcement made before the directorate at a recent meeting. The company has all orders it can handle in the near future. Plans for complete mills at Paris and for a mixing plant to be established in some Pacific coast city are being prepared. Selection of the site will be made and erection started immediately to handle the first Japanese shipment. At a recent meeting, John F. Parish and T. C. Doud, both of Portland, were elected directors to fill vacancies left by the resignations of C. A. Serrot, Nampa, Idaho, and E. R. Moarey, Portland. H. B. Dyer, Portland, was made secretary to succeed Mr. Serrot. Miss Neil Fisher, Portland, was elected assistant secretary. F. S. Irwin, Nampa, Idaho, is president of the company.

Price-Fixing and Trade Agreements Are Illegal Irrespective of Reasonableness

United States Supreme Court Reverses Decision of Circuit Court of Appeals in Sanitary Potters' Association Case

SINCE the United States Supreme court decisions in the now famous Maple Flooring Association and the Cement Manufacturers' Protective Association cases there has grown up an impression among members of these and similar trade associations that the Sherman anti-trust law was more or less of a back number, provided it could be shown that uniform (or even agreed upon) prices were modest and defensible as to reasonableness. This has probably come about from the prominence given the *reasonableness* of portland cement prices by the defense in the Cement Manufacturers' Protective Association case, and from the fact, proved in this case, that uniform prices may be established naturally and not necessarily by collusion.

A recent decision of the United States Supreme court in the Trenton Potteries et al. (Sanitary Potters Association) case will help to clear up this point and should lead to greater caution on the part of many trade associations whose managements seem to believe that the decision in the two former cases give them license to do certain things which are still prohibited by the Sherman anti-trust law.

Following are some the salient points from the text of the Supreme court decision:

Respondents, 20 individuals and 23 corporations, were convicted in the district court for southern New York of violating the Sherman anti-trust law, act of July 2, 1890, c. 647, 26 Stat. 209. The indictment was in two counts. The first charged a combination to fix and maintain uniform prices for the sale of sanitary pottery, in restraint of interstate commerce; the second, a combination to restrain interstate commerce by limiting sales of pottery to a special group known to respondents as "legitimate jobbers." On appeal, the court of appeals for the second circuit reversed the judgment of conviction on both counts on the ground that there were errors in the conduct of the trial. This court granted certiorari. 266 U. S. 597. Jud. Code, section 240.

Respondents, engaged in the manufacture or distribution of 82% of the vitreous pottery fixtures produced in the United States for use in bathrooms and lavatories, were members of a trade organization known as the Sanitary Potters' Association. Twelve of the corporate respondents had their factories and chief places of business in New Jersey; one was located in California and the others were situated in Illinois, Michigan, West Virginia, Indiana, Ohio and Pennsylvania. Many of them sold and delivered their product within the southern district of New York and some maintained sales offices and agents there.

There is no contention here that the verdict was not supported by sufficient evidence that respondents, controlling some 82% of the business of manufacturing and distributing in the United States vitreous pottery of the type described, combined to fix prices and to limit sales in interstate commerce to jobbers.

The issues raised here by the government's specification of errors relate only to the decision of the court of appeals upon its review of certain rulings of the district court made in the course of the trial.

It is urged that the court below erred in holding in effect (1) that the trial court should have submitted to the jury the question whether the price agreement complained of constituted an unreasonable restraint of trade;

(2) that the trial court erred in failing to charge the jury correctly on the question of venue;

(3) that it erred also in the admission and exclusion of certain evidence.

Reasonableness of Restraint Fixed

The trial court charged, in submitting the case to the jury that if it found the agreements or combination complained of, it might return a verdict of guilty without regard to the reasonableness of the prices fixed, or the good intentions of the combining units, whether prices were actually lowered or raised or whether sales were restricted to the special jobbers, since both agreements of themselves were unreasonable restraints.

These instructions repeated in various forms applied to both counts of the indictment. The trial court refused various requests to charge that both the agreements to fix prices and the agreement to limit sales to a particular group, if found, did not in themselves constitute violations of the law unless it was found that they unreasonably restrained interstate commerce. In particular the court refused to request to charge the following:

"The essence of the law is injury to the public. It is not every restraint of competition and not every restraint of trade that work an injury to the public; it is only an undue and unreasonable restraint of trade that has such an effect and is deemed to be unlawful."

Other requests of similar purport were refused.

The court below held specifically that the trial court erred in refusing to charge as requested and held in effect that the charge as given on this branch of the case was erroneous. This determination was based upon the assumption that the charge and refusals could be attributed only to a mistaken view of the trial judge, expressed in denying a motion at the close of the case to quash and dismiss the indictment, that the "rule of reason" announced in Standard Oil Co. and in American Tobacco Co. cases, which were units for injunctions, had no application in a criminal prosecution.

This disposition of the matter ignored the fact that the trial judge plainly and variously charged the jury that the combinations alleged in the indictment, if found, were violations of the statute as a matter of law, saying:

". . . the law is clear that an agreement on the part of the members of a combination controlling a substantial part of an industry, upon the prices which the members are to charge for their commodity, is in itself an undue and unreasonable restraint of trade and commerce; . . ."

If the charge itself was correctly given and adequately covered the various aspects of the case, the refusal to charge in another correct form or to quote to the jury extracts from opinions of this court was not error, nor should the court below have been concerned with the wrong reasons that may have inspired the charge, if correctly given. The question therefore to be considered here is whether the trial judge correctly withdrew from the jury the consideration of the reasonableness of the particular restraints charged.

Restraints Barred by Sherman Law

That only those restraints upon interstate commerce which are unreasonable are prohibited by the Sherman law was the rule laid down by the opinions of this court in the Standard Oil and Tobacco cases. But it does not follow that agreements to fix or maintain prices are reasonable restraints and therefore permitted by the statute, merely because the prices themselves are reasonable.

Reasonableness is not a concept of defi-

nite and unchanging content. Its meaning necessarily varies in the different fields of the law, because it is used as a convenient summary of the dominant considerations which control in the application of legal doctrines. Our view of what is a reasonable restraint of commerce is controlled by the recognized purpose of the Sherman law itself. Whether this type of restraint is reasonable or not must be judged in part at least in the light of its effect on competition, for whatever difference of opinion there may be among economists as to the social and economic desirability of an unrestrained competitive system, it cannot be doubted that the Sherman law and the judicial decisions interpreting it are based upon the assumption that the public interest is best protected from the evils of monopoly and price control by the maintenance of competition.

Aim and Result of Price Fixing

The aim and result of every price fixing agreement, if effective, is the elimination of one form of competition. The power to fix prices, whether reasonably exercised or not, involves power to control the market and to fix arbitrary and unreasonable prices.

The reasonable price fixed today may through economic and business changes become the unreasonable price of tomorrow. Once established, it may be maintained unchanged because of the absence of competition secured by the agreemnt for a price reasonable when fixed.

Agreements which create such potential power may well be held to be in themselves unreasonable or unlawful restraints, without the necessity of minute inquiry whether a particular price is reasonable or unreasonable as fixed and without placing on the government in enforcing the Sherman law the burden of ascertaining from day to day whether it has become unreasonable through the mere variation of economic conditions.

Moreover, in the absence of express legislation requiring it, we should hesitate to adopt a construction making the difference between legal and illegal conduct in the field of business relations depend upon so uncertain a test as whether prices are reasonable—a determination which can be satisfactorily made only after a complete survey of our economic organization and a choice between rival philosophies.

Thus viewed the Sherman law is not only a prohibition against the infliction of a particular type of public injury. It "is a limitation of rights . . . which may be pushed to evil consequences and therefore restrained."

Trial Court's Charge Proper

The charge of the trial court, viewed as a whole, fairly submitted to the jury the question whether a price-fixing agreement as described in the first count was entered into by the respondents. Whether the prices actually agreed upon were reasonable or unreasonable was immaterial in the circumstances charged in the indictment and necessarily found by the verdict. The requested charge which we have quoted, and others of similar tenor, while true as abstract propositions, were inapplicable to the case in hand and rightly refused.

The first count being sufficient and the case having been properly submitted to the jury, we may disregard certain like objections relating to the second count. The jury returned a verdict of guilty generally on both counts. Sentence was imposed in part on the first count and in part on both counts, to run concurrently. The combined sentence on both counts does not exceed that which could have been imposed on one alone. There is nothing in the record to suggest that the verdict of guilty on the first count was in any way induced by the introduction of evidence upon the second. In these circumstances the judgment must be sustained if either one of the two counts is sufficient to support it.

* * * * *

And in Thompson v. Cayser, 243 U. S. 66, 84, it was specifically pointed out that the Standard Oil and Tobacco cases did not overrule the earlier cases. The decisions in Maple Flooring Association and in Cement Manufacturers' Protective Association cases were made on the assumption that any agreement for price-fixing, if found, would have been illegal as a matter of law.

Jurisdiction Not in Issue

In point of substance, the jurisdictional facts were not in issue. Although the respondents were widely scattered, an important market for their manufactured product was within the southern district of New York, which was therefore a theater for the operation of their conspiracy, adjacent to the home of the largest group of the respondents located in a single state. The indictment sufficiently alleged that the conspiracy was carried on in the southern district of New York combined action under it. The record is replete with the evidence of witnesses for both prosecution and defense, including some of the accused, who testified without contradiction to the course of business within the district, the circulation of price bulletins and the making of sales there by some of the members of the association organized by respondents. The secretary testified that, acting for the association, he effected sales within the district. All of these were overt acts sufficient for jurisdictional requirements. In such a state of the record, the appellate court might well have refused to exercise its discretionary power to disturb the conviction because of the trial court's failure to give a charge not requested. If this failure to guard against the misinterpretation of a correct charge is to be deemed error, it was of such slight consequence in the actual circumstances of the case and could have been so easily corrected by the trial judge had his attention been directed to it, that the respondents should not have been permitted to reap the benefit of their own omission.

Alleged Errors in Evidence

The alleged errors in receiving and excluding evidence were rightly described by the court below as minor points. The trial lasted four and one-half weeks. A great mass of evidence was taken and a wide range of inquiry covered. In such a case a new trial is not likely to be ordered on grounds of technical errors in ruling on the admissibility of evidence which do not affect matters of substance.

* * * * *

Other objections urged by respondents to the sufficiency of the indictment and charge have received our consideration but do not require comment.

It follows that the judgment of the circuit court of appeals must be reversed and the judgment of the district court reinstated. —Reversed.

Mr. Justice Van Devanter, Mr. Justice Sutherland and Mr. Justice Butler dissent.

Mr. Justice Brandeis took no part in the consideration or decision of this case.

Fertilizer Manufacturers' Code for Maintenance of Fair Prices

THE fertilizer industry has been struggling for several years with competitive conditions destructive to the prosperity and efficiency of the industry. Recently a code of practices was drafted by a special committee of the association working in contact with the U. S. Department of Justice, and was adopted unanimously by the 126 firms represented at the annual meeting of the association. Since then more than 80 additional firms have also adopted the code.

The six major points dealt with in the code are as follows: (1) Sound cost accounting methods; (2) elimination of waste; (3) elimination of secret rebates; (4) avoidance of unsound credit terms; (5) no guaranty against decline of prices, and (6) exchange of statistical information.

The most interesting features of this code to other industries are, of course, the provisions aimed to secure fair and reasonable prices and to avoid cut-throat competition—unfortunately problems that nearly all the rock products industries expect to face this year. Following are these provisions of the code:

Open Competition Aim

3. *No Secret Discriminations and Rebates* —Manufacturers should scrupulously avoid the granting of secret rebates, irrespective

of the form assumed. Competition should express itself openly rather than in special and discriminatory form. Among practices violative of this principle which have heretofore prevailed, and the elimination of which is recommended, are the following:

(a) Providing truck servicce without adequate charge for the same, or reimbursing the dealer or purchaser for trucking costs.

(b) Providing local warehouse facilities, or reimbursing the dealer or purchaser for the actual or theoretical cost thereof.

(c) The sale, simultaneously with the sale of mixed fertilizer, of chemicals and materials at special concessions designed to be an inducement to the buyer to purchase mixed fertilizer.

(d) Failure to enforce in good faith the terms of contracts previously made for the sale of fertilizer.

(e) Making up special formulae or using special ingredients in standard formulae without making adequate charge for the cost of such special formulae or special ingredients.

(f) The making of special allowance to buyers for advertising.

(g) Adopting selling methods which, as experience has amply demonstrated, almost always promote secret rebates and concessions and put it out the power of the manufacturers to control them. Reference is here particularly made to the practice of selling through commission agents and others who are irregularly employed and the compensation of whom, without being "loaded" into the price, is measured in terms of quantity sold. Where experience has shown that commission men and like agents customarily resort to split commissions, secret rebates, etc., the manufacturers should sell only through regularly employed salaried salesmen and agents responsible to and directly controlled by the manufacturers.

(h) Extending credit terms which do not take into account the actual cost of money or of credit.

4. *Avoidance of Unsound Credit Terms.*—In certain sections of the country, buyers have customarily taken advantage of "open shipments" by taking and using the goods and then refusing to settle on any terms other than those satisfactory to the buyer and often quite different from the terms under which the contract of purchase and sale was made. Where this abuse has prevailed, manufacturers should sell only on terms such that, to obtain the bill of lading, the purchaser must make payment in cash or negotiable promissory note for the contract price.

Where delivery is made against promissory note, the note should be made payable at the earliest date consistent with the principle that the fertilizer should be paid for not later than the time when the crop for which the fertilizer is employed is marketed.

5. *No Guaranty Against Decline of Prices.*—Sales should be made at fixed prices and terms accepted in good faith by buyer and seller with the mutual intention of complete performance. The manufacturers should avoid selling under conditions which provide for a reduction of price of goods previously sold in the event of subsequent sales of like goods at lower prices.

The effect of this practice is to apply to all goods sold the lowest price which may be quoted by any competitor to any buyer, even though much below the cost of production. This puts the weaker manufacturers at the mercy of the stronger.

6. *Exchange of Statistical Information.*—In order that the relations of supply and demand and the statistical conditions existing from time to time in the fertilizer industry may be known, it is proposed to establish a bureau of statistics of the National Fertilizer Association, to which periodical statistical reports shall be made, giving information with respect to stocks on hand, production, shipments, average prices realized, and such other statistical information as may lawfully be assembled and exchanged and which shall relate to past and completed transactions. Details as to the foregoing will shortly be elaborated and submitted to the manufacturers.

Fertilizer Manufacturers' Code

The foregoing extracts of the code of trade practices of the National Fertilizer Association were explained to the members at their annual convention by John Foster Dulles, the association's legal counsel, in part as follows:

The Department of Justice realizes the seriousness of the situation as well as the members of the industry. Their investigation of the industry has been thorough, painstaking and on the whole fair. The Department of Justice has emerged from that investigation with a very vivid picture of the evils in the industry—of improper trade practices that had been adopted and of lax accounting methods, which make it impossible for anyone to tell whether he is selling at cost, at a profit or below cost.

The Department of Justice, realizing all this and realizing the importance of introducing lawful methods of co-operation and stabilization into the industry, has fully cooperated with the committee. The Department of Justice has approved the code by letter. I suppose most of you are not familiar with the type of letter which the Department of Justice usually writes in such cases as this. I have seen a great many of them, and I have talked to others who have seen a great many of them, and I think I can say that the Department of Justice has never written a letter with reference to a proposed code which goes so far and is so sympathetic as this letter. The letter, of course, contains the usual and necessary warning that the department cannot approve any code of trade practices, however legal in its beginning, if it is used as a cloak to do things that lie beyond those expressed in the code itself and that are illegal; but subject to that necessary and formal warning, this letter goes farther than any other letter I have ever seen, and is far more sympathetic in tone.

One objection which the Department of Justice has to the adoption of codes of trade practices is that they generally are not confined to the accomplishment of the particular purposes set out in the codes. They are often used as devices to cover more than what is set out in the code and to bring about what in effect is an actual agreement as to prices. I think it is my duty not merely to indicate the possibilities of constructive accomplishment in the code but also to warn you as to dangers.

Substantial uniformity of prices is an industry that dealers in a basic commodity is more or less necessary and desirable, and it may be an indication of the existence of keen competition. In nearly all industries that deal with basic commodities—industries that handle no trade-marked goods that command special prices—there is substantial uniformity of price. Take cotton, sugar, wheat, anything of that sort; the price of the same quality of goods in the same territory is substantially the same, no matter what company or dealer may offer the goods for sale. It is well recognized by court decisions and by the Department of Justice that substantial uniformity of price is in itself not evidence of illegal agreement to maintain uniform prices; that substantially uniform prices may and generally do result from the free operation of economic laws.

There is another type of uniformity of price, however, which is illegal. It cannot be distinguished from the normal and natural type of substantially uniform prices by anything except the method by which it is attained. That method involves the members of an industry, either formally or informaliy, by definite agreement or by a so-called gentlemen's agreement, in an understanding that certain prices will be maintained. Now it makes no difference how you may get that result. If any of you gentlemen talk with each other, directly or through emissaries, if in any way, direct or indirect, you have an exchange of ideas and views, and if you come from that exchange of views under an obligation, either legal or moral, to maintain your prices at a certain level, then you have done something illegal.

The essence of fair and free competition is not necessarily that you shall cut your competitor's price, but that you shall be free to do so if you see fit, and you shall not be restrained from doing so by any agreement, understanding or moral obligation to him not to cut his price. The question of cutting your price or of fixing the level of your price must be a matter for your own independent judgment, not restrained by any considerations as to an obligation to a competitor, whether legal or moral. You may get all the information you can about what your competitor is going to do and the situation of the industry, statistical or otherwise; you may collect information; you may base your action upon any available information, but the actual control of your price, the actual decision as to what it shall be and as to whether you shall change it must rest entirely upon your own judgment; it must not be restrained by any obligation, legal or moral, to any competitor.

If, as a result of your meetings, you should feel that if you should cut or change your price you would be guilty of an ungentlemanly act or breach of a moral or legal obligation, that feeling is evidence that you have entered upon a road which may well be illegal. I cannot lay down any definite rule whereby you can say that this particular thing is legal and that particular thing is illegal. You must sense that propriety or impropriety for yourself; but, as I say, if as a result of any meeting together or any exchange of views you go away with the feeling that you are morally or legally committed not to change your prices and that if you did so you would be guilty of a breach of a moral or legal obligation, then you probably have passed the line of what is legal. Subject, however, to that restraint you may, as I say, fix your prices, hold your prices, depart from your prices, do as you will, on the basis of any authentic information that you can gather. You may get all the information that you can, and the purpose of the association will be to facilitate the getting of information that will lead to the maintenance of a sound price level, but it must be maintained free from any moral or legal obligation that binds you to adhere to any definite price level.

Portland Cement Output in January

Production and Shipments Above Last Year—Stocks Nearly Equal to High Record of March, 1926

JANUARY production, shipments and stocks of portland cement show increases over the corresponding period in 1926, according to the Bureau of Mines, Department of Commerce. Production shows an increase of over 4% and shipments an increase of 5%, as compared with January, 1926. Shipments of portland cement exceed those of January in all other years. Portland cement stocks at the end of January, 1927, are over 11% greater than at the end of January, 1926, and are exceeded only by those at the end of March, 1926.

These statistics, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are compiled from reports for January, 1927, received direct from all manufacturing plants except four, for which estimates were necessary on account of lack of returns.

Clinker Stocks

Stocks of clinker, or unground cement, at the mills at the end of January, 1927, amounted to about 10,037,000 bbl. compared with 7,799,000 bbl. (revised) at the beginning of the month.

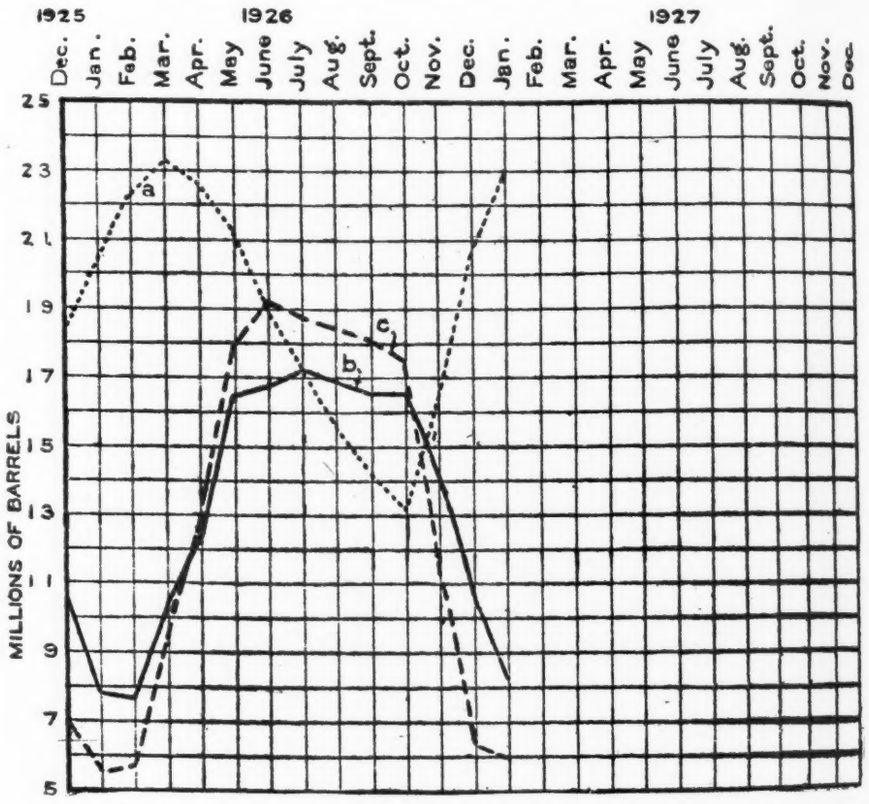
An estimate of the unground clinker by months is given below.

ESTIMATED CLINKER (UNGROUND CEMENT) AT THE MILLS AT END OF EACH MONTH, 1926 AND 1927, IN BARRELS

Month	1926	1927
January	9,074,000	10,037,000
February	10,931,000	
March	12,290,000	
April	12,967,000	
May	11,695,000	
June	10,144,000	
July	8,604,000	
August	7,362,000	
September	6,112,000	
October	5,370,000	
November	5,748,000	
December	*7,799,000	

*Revised.

MONTHLY FLUCTUATION IN PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT



(a) Stocks of finished portland cement at factories; (b) Production of finished portland cement; (c) Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during the months of November and December, 1925 and 1926:

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN NOVEMBER AND DECEMBER, 1925 AND 1926, IN BARRELS*

Shipped to—	1925—Nov.—1926		1925—Dec.—1926	
Alabama	161,142	134,009	108,906	117,426
Alaska	132	173	132	297
Arizona	36,310	27,412	61,646	39,536
Arkansas	43,423	79,627	43,281	42,245
California	972,874	887,351	938,721	901,526
Colorado	61,541	61,057	30,872	31,711
Connecticut	148,990	147,288	56,260	52,141
Delaware	24,504	17,682	13,680	6,528
District of Columbia	106,642	78,369	57,119	64,457
Florida	251,285	418,696	439,786	317,402
Georgia	104,559	161,710	69,046	110,139
Hawaii	8,410	21,417	20,735	25,732
Idaho	19,245	25,409	15,993	13,199
Illinois	817,588	776,758	407,808	446,515
Indiana	233,595	289,720	114,856	108,771
Iowa	96,762	116,116	41,325	37,153
Kansas	172,945	169,035	87,368	88,010
Kentucky	99,170	120,647	63,382	62,172
Louisiana	75,513	74,619	74,464	89,843
Maine	17,453	19,168	7,028	6,255
Maryland	140,656	212,972	85,377	135,181
Massachusetts	258,733	234,087	133,365	72,231
Michigan	537,713	702,901	302,889	292,167
Minnesota	168,138	87,777	62,943	40,916
Mississippi	53,244	61,685	34,740	60,858
Missouri	478,531	315,318	207,230	152,647
Montana	13,819	16,169	7,382	6,455
Nebraska	82,528	64,198	34,633	26,933
Nevada	5,751	4,751	4,015	3,150
New Hampshire	35,808	32,190	22,586	18,340
New Jersey	566,337	688,736	329,054	255,744
New Mexico	16,735	18,965	10,258	13,639
New York	1,249,902	1,584,352	889,639	788,046
North Carolina	200,447	276,568	152,699	183,912
North Dakota	9,531	8,969	2,474	2,439
Ohio	545,452	651,257	339,030	312,336
Oklahoma	226,437	225,767	148,354	120,560
Oregon	73,583	75,541	46,531	47,637
Pennsylvania	945,344	1,013,955	597,328	469,376
Porto Rico	577	7,250	0	13,250
Rhode Island	50,609	47,278	26,721	19,813
South Carolina	69,234	46,692	54,545	31,523
South Dakota	14,080	10,076	6,379	3,625
Tennessee	104,657	124,551	80,322	82,556
Texas	280,852	419,358	284,061	303,770
Utah	24,607	34,358	21,135	12,944
Vermont	9,301	14,455	4,066	3,844
Virginia	104,185	127,290	72,698	61,351
Washington	106,111	131,602	82,364	90,856
West Virginia	80,179	104,150	63,066	63,680
Wisconsin	173,988	169,068	77,100	95,776
Wyoming	9,403	8,160	7,968	7,430
Unspecified	29,247	54,253	8,140	396
	10,117,802	11,200,962	6,851,500	6,354,439
Foreign countries	69,198	75,038	65,500	77,561
Total shipped from cement plants	10,187,000	11,276,000	6,917,000	6,432,000

*Includes estimated distribution of shipments from three plants in November and December, 1925, and from five plants in November and December, 1926.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1926 AND 1927, IN BARRELS

Month	Production 1926	Production 1927	Shipments 1926	Shipments 1927	Stocks at end of month 1926	Stocks at end of month 1927
January	7,887,000	8,222,000	5,674,000	5,956,000	20,582,000	22,882,000
February	7,731,000	.....	5,820,000	.....	22,385,000	.....
March	10,390,000	.....	9,539,000	.....	23,236,000	.....
First quarter	26,008,000	.....	21,033,000	.....	.....	.....
April	12,440,000	.....	12,965,000	.....	22,710,000	.....
May	16,510,000	.....	17,973,000	.....	21,255,000	.....
June	16,866,000	.....	19,134,000	.....	19,000,000	.....
Second quarter	45,816,000	.....	50,072,000	.....	.....	.....
July	17,134,000	.....	18,812,000	.....	17,301,000	.....
August	16,995,000	.....	18,583,000	.....	15,718,000	.....
September	16,571,000	.....	18,087,000	.....	14,188,000	.....
Third quarter	50,700,000	.....	55,482,000	.....	.....	.....
October	16,596,000	.....	17,486,000	.....	13,334,000	.....
November	14,193,000	.....	11,276,000	.....	16,243,000	.....
December	10,744,000	.....	6,432,000	.....	*20,616,000	.....
Fourth quarter	41,533,000	.....	35,194,000	.....	.....	.....
	164,057,000	.....	161,781,000	.....	.....	.....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JANUARY, 1926 AND 1927, AND STOCKS IN DECEMBER, 1926, IN BARRELS

Commercial district	Production 1926—Jan.—1927		Shipments 1926—Jan.—1927		Stocks at end of 1926—Jan.—1927		Stocks at end of December, 1926*
E'n Penn., N. J. & Md.	2,765,000	2,510,000	1,469,000	1,422,000	3,805,000	5,122,000	4,034,000
New York	623,000	318,000	205,000	165,000	1,447,000	1,438,000	1,284,000
Ohio, W'n Penn. & W. Va.	523,000	527,000	382,000	411,000	2,455,000	2,576,000	2,460,000
Michigan	292,000	448,000	212,000	261,000	1,994,000	2,085,000	1,898,000
Wis., Ill., Ind. & Ky.	542,000	923,000	476,000	461,000	3,574,000	3,444,000	2,982,000
Va., Tenn., Ala. & Ga.	961,000	899,000	845,000	921,000	966,000	1,173,000	1,196,000
E'n Mo., Ia., Minn. & S. Dak.	435,000	509,000	281,000	247,000	2,979,000	3,199,000	2,936,000
W'n Mo., Neb., Kan. & Okla.	225,000	468,000	325,000	398,000	1,556,000	1,847,000	1,777,000
Texas	330,000	383,000	308,000	365,000	502,000	461,000	444,000
Colo., Mont. & Utah	48,000	121,000	73,000	77,000	392,000	517,000	473,000
California	1,034,000	974,000	984,000	1,088,000	533,000	551,000	665,000
Ore. & Wash.	109,000	142,000	114,000	140,000	379,000	469,000	467,000
	7,887,000	8,222,000	5,674,000	5,956,000	20,582,000	22,882,000	20,616,000

*Revised.

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN DECEMBER, 1926

Imported from	District into which imported	Barrels	Value
Belgium	Florida	20,577	$39,262
	Galveston	3,580	5,073
	Maine & N. H.	5,797	12,480
	Massachusetts	60,916	86,258
	New Orleans	16,812	25,888
	New York	†	5
	Oregon	30	44
	Philadelphia	17,753	26,703
	Porto Rico	3,241	5,339
	Total	128,706	$201,052
Canada	Vermont	655	$1,480
Denmark and Faroe Islands	New York	†	9
	Porto Rico	13,005	$20,882
	Total	13,005	$20,891
France	New York	2,324	$5,381
Germany	Porto Rico	1,054	$2,350
Japan	Hawaii	1,001	$1,958
United Kgdom.	Los Angeles	2,877	$9,102
	Maryland	250	465
	Massachusetts	500	787
	New York	1,478	2,827
	Total	5,105	$13,181
	Grand total	151,850	$246,293

EXPORTS AND IMPORTS*

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN DECEMBER, 1926

Exported to—	Barrels	Value
Canada	632	$2,555
Central America	8,827	42,980
Cuba	9,278	22,562
Other West Indies	5,804	14,485
Mexico	4,575	14,001
South America	52,957	163,270
Other countries	7,903	45,385
	89,976	$305,238

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN DECEMBER, 1926*

	Barrels	Value
Alaska	2,086	$5,872
Hawaii	22,497	50,362
Porto Rico	20,970	50,971
	45,553	$107,205

*Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision. †Not recorded.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1925 AND 1926

Month	Exports 1925 Barrels	Exports 1925 Value	Exports 1926 Barrels	Exports 1926 Value	Imports 1925 Barrels	Imports 1925 Value	Imports 1926 Barrels	Imports 1926 Value
January	71,596	$207,547	72,939	$216,431	231,258	$364,196	360,580	$576,717
February	56,249	181,356	73,975	220,706	119,077	206,308	314,118	527,948
March	65,248	200,410	69,080	205,647	218,048	337,039	493,241	812,968
April	89,508	263,831	96,296	284,772	197,686	280,826	257,302	398,114
May	85,385	250,345	78,601	224,365	186,897	286,959	223,130	337,031
June	71,343	217,899	80,684	248,814	254,937	409,539	335,570	495,744
July	98,141	286,543	130,822	370,220	335,118	499,602	250,862	395,981
August	103,961	289,904	64,946	216,489	379,847	611,551	350,638	560,532
September	102,649	285,225	70,920	239,174	513,252	789,121	194,129	308,224
October	73,369	228,467	69,389	225,874	535,050	824,268	263,403	386,335
November	101,825	294,201	76,598	238,103	388,604	678,518	55,233	82,949
December	100,323	296,900	89,976	305,238	295,543	526,001	151,850	246,293
	1,019,597	$3,003,128	974,226	$2,995,833	3,655,317	$5,813,928	3,250,056	$5,128,836

Oregon Cement Manufacturers Urge Restrictions on Cement Imports

HOW Oregon is being used as a dumping ground for foreign cement shipped in as ballast was told by a delegation appearing recently before the state senate committee on industries in behalf of Senate Bill 261.

The measure provides that all foreign cement imported into the state by water shall be shipped in dustproof and waterproof sacks. Its purpose is twofold, first to protect home industry and second to protect the health of longshoremen handling the product. The cost of the sacks would be approximately 25 cents a barrel, and to that extent it would operate as a differential in favor of the home product. However, even then the foreign product would be sold cheaper on the market than local cement.

Dan Malarkey, attorney for the cement manufacturers in the state, was the first speaker, and he drove home both of the above points. He stated that foreign labor in connection with the manufacture of foreign cement was paid approximately one-fifth of the wages of American labor. In addition to Oregon being deluged with foreign cement from Belgium and the Scandinavian countries, California dumps its surplus into Oregon, the speaker asserted.

E. J. Stack, representing labor, stated that labor had always favored such legislation from the standpoint of health protection, as well as the protection of home industry.

D. L. Carpenter, president of the Beaver Portland Cement Co., of Gold Hill, and George M. McDowell, a stockholder in the same company, also spoke for the bill. Mr. McDowell stated that when he was manager for Grace & Co. this concern shipped in foreign cement for the actual cost of loading and discharging the cargo, which was approximately 50 cents a ton. It costs three times as much to ship cement from Portland to Salem as it does from foreign countries to Portland, he asserted.

M. G. Millard, representing a California cement company, stated that the bill would raise the price of foreign cement about 20 cents a barrel, and objected on this ground. He was asked if his company shipped cement to other countries in dustproof sacks and he admitted that it did.

John F. Logan, representing the Pacific Portland Cement Co., Consolidated, was also against the bill. He prefaced his remarks with the statement that California always protected its industries, but felt that the particular measure might contravene the constitution of the United States.

D. C. Freeman, secretary of the Oregon Manufacturers' Association, urged the amendment of the bill from the viewpoint of both local industry and health.—*Portland Telegram.*

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	.....	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	.....	1.60	1.30	1.30	1.30
Danbury, Conn.	2.25	2.25	2.00	1.75	1.50	.....
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@ .75	1.20@1.30	1.15@1.25	1.10@1.15	1.10@1.15	1.05@1.10
Munns, N. Y.	1.00	1.50	1.50	1.25	.....	.....
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@1.60	1.40@1.60	.....
Prospect, N. Y.	1.00	1.50	1.40	1.30	1.30	.....
Walford, Penn.	.70	.....	1.35h	.....	.....	.....
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Bloomville. Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.00	1.00	1.00
Buffalo, Iowa	1.10	.....	1.50	1.30	1.35	1.35
Chasco, Ill.	1.00@1.30	.....	1.00@1.15	.....	1.00@1.15	.....
Columbia, Krause, Valmeyer, Ill.	1.10@1.50	1.10@1.25	1.20@1.35	1.10@1.35	1.10@1.35	‖1.25
Flux (Valmeyer)	1.10@1.50	.....	.....	1.75	.....	1.75
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood and Buffalo, Ia.	1.10	.....	1.30	1.20	1.25	1.25
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
River Rouge, Mich.	1.20	1.20	1.20	1.20	1.20	1.20
Montreal, Que.	.80	1.35	1.15	.90	.95	.95
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Ont.	1.55	2.05	2.05	1.90	1.90	1.90
Stone City, Iowa	.75	.....	†1.10	1.05	1.00	.....
Waukesha, Wis.	.90	.90	.90	.90	.90	.90
Wisconsin Points	.50	.....	1.00	.90	.90	.....
SOUTHERN:						
Alderson, W. Va.	.50	1.45	1.35	1.30	1.25	1.20
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Brooksville, Fla.	.75	.....	2.65	2.65	2.40	2.00
Cartersville, Ga.	1.50	1.50	1.80	1.35	1.15	1.15
Chico, Tex.	1.00	1.35	1.25	1.20	1.10	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.50	1.35	1.35	1.20	1.20	.....
Graystone, Ala.	Crusher run, 1.00 per ton					
Kendrick and Santos, Fla.	3½ in. and less, 1.00 per ton					
Ladds, Ga.	.....	.....	1.50	1.35	1.15	.....
New Braunfels, Tex.	.60	1.25	1.10	.90	.90	.90
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.35	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kans.	.25	1.90	1.90	1.90	1.90	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Kansas City, Mo.	.75	1.50	1.50	1.50	1.50	1.50
Rock Hill, St. Louis Co., Mo.	1.35	1.35	1.35	1.25	1.25	1.25

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	.....	.....	.....
Duluth, Minn.	.90	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.00	1.00	1.00	.90	.90	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.00	1.55	1.35	1.25	.....
New Haven, New Britain, Meriden and Wallingford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.70	2.20	2.00	1.60	1.60	.....
Oakland and El Cerito, Cal.	1.00	1.00	1.00	.90	.90	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
San Diego, Calif.	.....	2.75	2.55	2.35	2.35	.....
Springfield, N. J.	2.00	2.10	2.10	1.70	1.60	1.60
Toronto, Ont.	.....	3.58@4.05	3.05@3.80	.....	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Coldwater, N. Y.—Dolomite	1.50 all sizes					
Columbia, S. C.	.....	2.00	1.75	1.75	1.60	.....
Eastern, Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.	Crushed flint rock, 2.50 per cu. yd.					
Lithonia, Ga.	.75	1.60b	1.60f	1.40	1.30	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	1.50 to 1.85					
Toccoa, Ga.	.....	.....	1.40	1.25	1.25	1.25

*Cubic yd. †1 in. and less. ‡Two grades. ‖Rip rap per ton. (a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30 (e) Dust. (f) ¼ in. (h) less 10c discount. (i) 1 in., 1.40.

Agricultural Limestone

(Pulverized)

Alderson, W. Va. — Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.50
Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh	5.00
Asheville, N. C. — Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton and Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Charleston, W. Va.—Marl, per ton, bulk	3.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Tex.—50% thru 50 mesh, 1.75; 50% thru 100 mesh	2.25
Colton, Calif.—Analysis 90% $CaCO_3$, bulk	4.00
Cypress, Ill.—90% thru 100 mesh	1.35
Ft. Springs, W. Va.—50% thru 4 mesh	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh, bags	3.95
Bulk	2.70
(Paving dust)—80% thru 200 mesh, bags	4.25@ 4.75
Bulk	3.00@ 3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.25; bulk	2.75
Joliet, Ill.—90% thru 100-mesh	4.25
Knoxville, Tenn.—80% thru 200 mesh, 3.00; 80% thru 100 mesh, bulk	2.70
Ladds, Ga. — Analysis, $CaCO_3$, 58%; $MgCO_3$, 32%; pulverized; 50% thru 50 mesh	1.50
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marlbrook, Va.—Marl, per ton, bulk	2.25
Marion, Va. — Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Middlebury, Vt. — $CaCO_3$, 99.05%; 50% thru 200 mesh; sacked	5.50
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 95%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Syracuse, N. Y. — Analysis, 89% $CaCO_3$; $MgCO_3$, 4%; bags, 4.25; bulk	2.75
Toledo, Ohio, 30% through 50 mesh	2.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.30
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50
West Stockbridge, Mass. — Analysis 90% $CaCO_3$, 50% thru 100 mesh; cloth bags, 4.75; paper, 4.25; bulk	3.25

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 10 mesh; 25% thru 100 mesh; 50% thru 50 mesh	1.50
Brandon and Middlebury, Vt.—Pulverized, bags, 5.50; bulk	3.00

(Continued on next page)

Agricultural Limestone

Bridgeport and Chico, Texas—Analysis. 94% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh 1.75
50% thru 4 mesh 1.50
Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh ..... .80
Columbia, Krause. Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 100% thru 4 mesh ..... 1.10@ 1.50
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh 1.35
Danbury, Conn.—Analysis, 79% $CaCO_3$, 11% $MgCO_3$; 60% thru 100 mesh; 80% thru 50 mesh; 100% thru 4 mesh; bags, 4.25; bulk 3.25
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh 1.50
Kansas City, Mo.—50% thru 100 mesh ..... .75
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh 2.00
Screenings (¼ in. to dust) 1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk 1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh ..... 1.85@ 2.35
McCook, Ill.—90% thru 4 mesh ..... .90
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% $CaCO_3$, 54% $MgCo_3$; meal, 100% thru 4 mesh; 20% thru 100 mesh 1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50
Mountville, Va.—Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh bags 5.50
Pixley, Mo.—Analysis, 96% $CaCO_3$; 50% thru 50 mesh 1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh 1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk ..... .80@ 1.40
Stone City, Iowa.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes 1.25

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk 3.00
Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh; (for mine dusting and asphalt filler) 3.50
Piqua, Ohio, sacks, 4.50@5.00 bulk ..... 3.00@ 3.50
Rocky Point, Va.—82% thru 200 mesh, 2.50@3.50 bulk, paper bags ..... 3.75@ 4.75
Waukesha, Wis.—90% thru 100 mesh, bulk 4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Berkeley Springs, W. Va. ..... 2.00@ 2.25
Buffalo, N. Y. ..... 2.00@ 2.50
Cedarville and S. Vineland, N. J.—
Damp 1.75
Dry 2.25
Columbus, Ohio ..... 1.00@ 1.50
Estill Springs and Sewanee, Tenn. 1.50
Gray Summit and Klondike, Mo. ..... 1.75@ 2.00
Los Angeles, Calif.—Washed 5.00
Mapleton Depot, Penn. ..... 2.00@ 2.25
Massillon, Ohio 3.00
Mendota, Va. ..... 2.25@ 2.50
Michigan City, Ind. ..... .30@ .35
Mineral Ridge and Ohlton, Ohio 2.50
Oceanside, Calif. 3.00
Ottawa, Ill. ..... .75@ 1.00
Pittsburgh, Penn. ..... 3.00@ 4.00
Ridgway, Penn. 2.50
Rockwood, Mich. ..... 2.75@ 3.25
Round Top, Md. 2.00
San Francisco, Calif. ..... 4.00@ 5.00
Silica, Va. ..... 2,25@ 2.50
St. Louis, Mo. 2.00
Sewanee, Tenn. 1.50
Thayers, Penn. 2.50
Utica, Ill. ..... .90@ 1.15

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Columbus, Ohio	.30@	1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	.65@ 1.25
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Erie, Pa.		1.00*		1.50*	1.75*	
Farmingdale, N. J.	.58	.48	.85	1.25	1.15	
Hartford, Conn.	.65*					
Leeds Junction, Me.		.50	1.75		1.35	1.25
Machias Jct., N. Y.	.75	.75	.85	.75	.75	.75
Montoursville, Penn.	1.00	.90	1.00	.85	.85	.80
Portland, Me.		1.00	2.25		2.00	
Shining Point, Penn.			1.00	1.00	1.00	1.00
Somerset, Penn.		2.00				
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.	.60@ .85	.60@ .85	1.70	1.50	1.30	1.30
York, Penn.	1.10	1.00				
CENTRAL:						
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Appleton and Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Attica, Ind.			All sizes .75@.85			
Barton, Wis. (f)		.50		.75	.75	.75
Chicago district, Ill.	.70	.55	.55	.60	.60	.60
Columbus, Ohio		.85	.85	.85	.85	
Des Moines, Iowa	.40	.40	1.40	1.40	1.40	1.40
Eau Claire and Chippewa Falls, Wis.	.30@ .40	.40	.80@1.25	.90	.90	
Elkhart Lake, Wis.	.60	.60	.70	.70	.70	.60
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Grand Haven, Mich.		.60@ .70		.70@ .90		.70@ .90
Grand Rapids, Mich.		.50		.80	.80	.70
Hamilton, Ohio		1.00	1.00	1.00	1.00	1.00
Hersey, Mich.		.50				.70
Humboldt, Iowa	.50	.50	1.50	1.50	1.50	1.50
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Joliet, Plainfield and Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Ia.	.50@ .60	.50@ .60	1.30	1.30	1.20	1.20
Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Mattoon, Ill.	.75@ .85	.60@ .85	.85	.85	.85	.85
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.40@ .60	.40@ .60	1.25	1.25	1.25	1.25
Pittsburgh, Penn.	1.25	1.25	.85	.85	.85	.85
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	.83	1.45	1.55a	1.45	1.45	1.45
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.25	1.25
Zanesville, Ohio		.60	.50	.60	.80	
SOUTHERN:						
Charleston, W. Va. (b)			All sand, 1.40. All gravel, 1.40			
Brewster, Fla.	.60	.60	2.25			
Chattahoochie River, Fla.		.70		1.75		
Eustis, Fla.		.50@ .60				
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Knoxville, Tenn.	1.25	1.25		1.20		1.20
Lindsay, Texas					.55	
Macon, Ga.		.50				
New Martinsville, W. Va.	1.00	.90@1.00		1.20@1.30		.80@ .90
Roseland, La.	.50	.50	1.25	1.50	.85	.85
WESTERN:						
Kansas City, Mo.		.70				
Los Angeles, Calif. (d)	.50	.50	1.10	1.10		1.10c
Oregon City, Ore.		1.50*	1.50*	1.50*	1.50*	1.50*
Phoenix, Ariz.	1.25*	1.25*	2.50*	2.00*	1.50*	1.25*
Pueblo, Colo.	.75	.60		1.15		1.20
San Diego, Calif.	.65@ .75	.65@ .75	1.50	1.30	1.10	1.10
Seattle, Wash. (bunkers)	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.				Dust to 3 in., .40		
Chicago district, Ill.	.35					.65@1.00
Ferrysburg, Mich.						
East Hartford, Ohio	.75*					
Gainesville, Texas					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio				.67		
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Joliet, Plainfield and Hammond, Ill.	.35	1.25			.90	
Macon, Ga.	.35@ .50					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Ottawa, Oregon, Moronts and Yorkville, Ill.			Ave. .60 per ton all sizes			
Roseland, La.	.35					
Somerset, Penn.		1.85@2.00		1.50@1.75		
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Penn.	1.10	1.00				

(a) ⅝ in. down. (b) River run. (c) 2½ in. and less.
*Cubic yd. †Include freight and bunkerage charges and truck haul. ‡Delivered on job by truck.
(d) Less 10c per ton if paid E.O.M. 10 days. (e) pit run. (f) plus 15c winter loading charge.
(g) ¼-in. and less.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	2.75	2.75	2.75	1.75@2.75	1.75	1.75@4.00	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75@2.00	1.75@2.00		1.75	2.00		1.75
Buffalo, N. Y.	1.50	1.50		2.00@2.50			
Columbus, Ohio	1.25@2.00	1.25@1.75	2.00@2.50	.30@1.50	2.00@2.50	2.75@3.50	1.50@3.00
Dresden, Ohio	1.50@1.75	1.50	1.75	1.25			
Eau Claire & Chippewa Falls, Wis.						3.00@4.00	
Elco, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Pa.	2.00	2.00	2.25	2.00			
Klondike, Mo.	1.75@2.00		1.75@2.00	1.75@2.00	1.75@2.00		1.75
Mapleton Depot, Pa.	2.25	2.00		2.00			
Massillon, Ohio	2.25	2.25		2.50	2.50		
Mendota, Va.	Ground flint or silex—16.00@20.00 per ton						
Michigan City, Ind.				.30@ .35	.30@ .35		
Millville, N. J.				1.75b		3.50	
New Lexington, O.	2.75	2.25					
Ohlton, Ohio	1.75b	1.75b		2.00b	1.75b	1.75b	
Ottawa, Ill.	2.50	1.25	2.50	1.00	.75	3.50	3.50
Ridgeway, Pa.	1.50	1.50	1.75@2.00c	2.50d			
Round Top, Md.	1.25			1.60		2.25	
San Francisco and Oakland, Calif.	3.50	5.00	3.50	3.50@5.00e	3.50@5.00	3.50@5.00	
Silica, Va.				10.00@16.00			
Thayers, Penn.	1.25	1.25		2.00			
Utica, Ill.¶	.50@ .75	.50@ .75		.50@ .75	.75		
Utica, Ill.	.55.	.60		.75	.75		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	*1.75@2.25	*1.75@2.25	*1.75	*1.75@2.25	*1.75@2.25		
Zanesville, Ohio	2.00‡	1.50‡	2.00‡	2.00	2.00		

*Green. †Crude silica, crushed and screened, not washed or dried. ‡Plus 75c per ton for winter loading. ¶Crude. §Crude and dry. (a) Delivered. (b) Damp. (c) Shipped from Albany. (d) Delivered Buffalo or Black Rock. (e) Washed and drained only, 1.50.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Emporium, Erie and Dubois, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.75		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*		1.45*	
Jackson, Ohio		1.05*		1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.25	1.25	1.25	1.25	1.25	1.25
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.45*		1.55*	1.55*	1.55*	1.55*
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruessens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.15e
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95d
Chazy, N. Y.		8.50	7.50	10.00		15.50$_9$	8.50	14.00
Lime Ridge, Penn.							5.00a	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00t
Williamsport, Penn.			10.00				6.00	
York, Penn.		9.50	9.50	10.50	8.50	10.50	8.50	1.65i
CENTRAL:								
Afton, Mich.							8.50	1.35
Carey, Ohio	12.50	8.50	8.00		9.00		8.00	2.00
Cold Springs, Ohio		8.50	8.50				8.00	
Delaware, Ohio	15.00	8.50	8.50	10.00			7.50	1.50$_6$
Frederick, Md.		10.00	10.00	10.00	8.50	10.00	7.00	
Gibsonburg, Ohio	12.50	8.50	8.50		9.00	11.00	8.00	
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio	12.50							
Marblehead, Ohio		8.50	8.50		9.00		8.00	1.50w
Milltown, Ind.		9.00@10.00		10.00p			8.50q	1.40r
Sheboygan, Wis.	11.50				9.50		9.50	
Wisconsin points (f)		11.50					9.50	
Woodville, Ohio	12.50	8.50	8.50	13.50$_8$			8.00	1.50c
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Texas							7.00	1.50
Graystone, Ala.	12.50	10.00					8.50	1.50
Keystone, Ala.	10.00	8.00	8.00	8.00			7.00	1.25
Knoxville, Tenn.	20.25	8.00	8.00	8.00	7.00		7.00	1.25
New Braunfels, Tex.	18.00	12.00	10.00	12.00	10.00		9.50	
Ocala, Fla.	12.00	11.00	10.00				12.00	1.50
Saginaw, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
WESTERN:								
Kirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Los Angeles, Calif.	19.00	19.00	14.00		16.20		12.50	2.50
Dittlinger, Tex.		12.00@13.00					9.50p	1.50$_4$
San Francisco, Calif.	21.00	19.00	16.50				14.00	2.00
Tehachapi, Calif.			8.00				13.00z	2.20x
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

†50-lb. paper bags; (a) net ton; (c) wooden, steel 1.70; (d) steel; (e) per 180-lb. barrel; (f) dealers' prices, net 30 days less 25c disc. per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days; (i) 180-lb. net barrel, 1.65; 280-lb. net barrel, 2.65; (p) to 11.00; (q) to 8.75; (r) to 1.50; (s) in 80-lb. burlap sacks; (t) to 3.00; (u) two 90-lb. bags; (v) oil burnt; wood burnt 2.25@2.50; (x) wood. steel 2.30; (z) to 15.00; (*) quoted f.o.b. New York; (‡) paper bags; (w) to 1.50 in two 90-lb. bags, wood bbl. 1.60; (1) to 10.00; ($_3$) 80-lb. paper bags; ($_4$) to 3.00; ($_5$) to 9.00; ($_6$) to 1.60. ($_8$) to 16.00; ($_8$) wood bbl., steel, 1.80; ($_7$) quoted f.o.b. Marble Cliff, Ohio; ($_8$) superfine; ($_9$) barrels.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Mapleton Depot, Penn.	2.00	2.00@ 2.25
Massillon, Ohio		2.25
Michigan City, Ind. (Engine sand)		.20@ .30
Mineral Ridge, Ohio	*1.75	*1.75
Montoursville, Penn.		1.00@ 1.10
Ohlton, Ohio	1.80	1.80
Ottawa, Ill.	1.25@ 2.50	1.25
Red Wing, Minn.		1.25
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50	3.50
Thayers, Penn.		2.25
Utica, Ill.	†.90	.90
Warwick, Ohio		2.25
Zanesville, Ohio		2.50

*Wet. †Fine; coarse dry, 3.00@3.50.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel worker's crayons, per gross	1.00@ 1.50
Chatsworth, Ga.:	
Crude talc	4.00@ 5.00
Ground talc (20-50 mesh)	6.00@ 8.00
Ground talc (150-200 mesh)	6.00@12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.00
Misc. (cubes, blanks, chalk, etc.), per lb.	.10@ .20
Chester, Vt.:	
Crude talc	3.50@ 4.00
Ground talc (150-200 mesh), bulk	8.00@ 9.00
Including bags	9.00@10.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc	5.00
Ground talc (150-200) bags	10.00@12.00
Pencils and steel workers' crayons, per gross	1.00@ 1.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) including bags, 300-350 mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.00
Ground talc (150-200 mesh), bulk	7.75@14.00
Joliet, Ill.:	
Roofing talc, bags	12.00
Ground talc (200 mesh), bags	30.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (125-200 mesh), bags	10.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 68-72%..	3,75@ 4.25
Mt. Pleasant, Tenn.—B.P.L. 75%	5.50@ 6.00
Tennessee—F.O.B. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00

Ground Rock

(2000 lbs.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%..	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 65%	8.00@10.00
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton.)

Florida—F. O. B. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, F.O.B. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—per ton,	
Mine run	360.00
Clean shop scrap	25.00
Mine scrap	22.00
20 mesh	30.00
60 mesh	45.00
100 mesh	50.00
Roofing mica	35.00
Punch mica, per lb.	.12

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars	.....	10.50
Brandon, Vt.—English pink, English cream and coral pink	*11.00	*11.00
Brandon grey	*11.00	*11.00
Brighton, Tenn.—Pink	6.00	5.00
Mixed pink and bronze	4.50@ 6.00	4.50@ 6.00
All colors, mixed sizes	3.50	3.50
Buckingham, Que.—Buff stucco dash	.....	12.00@14.00
Chicago, Ill. — Stucco chips, in sacks f.o.b. quarries	.....	17.50
Crown Point, N. Y.—Mica spar	.....	9.00@10.00
Dayton, Ohio	.....	6.00@24.00
Easton, Penn., and Phillipsburg, N. J.	.....	12.00@20.00
Haddam, Conn. — Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash	.....	4.25
Middlebrook, Mo.—Red	.....	20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	.....	5.50
Milwaukee, Wis.	.....	14.00@34.00
Newark, N. J.—Roofing granules	.....	7.50
New York, N. Y.—Red and yellow Verona	.....	32.00
Red Granite, Wis.	.....	7.50
Stockton, Calif. — "Natrock" roofing grits	.....	12.00@15.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	.....
Wauwatosa, Wis.	.....	20.00@32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00

†C.L. L.C.L. 17.00.
*C.L. including bags; L.C.L. 14.50
‡C.L. including bags, L.C.L. 10.00.

Potash Feldspar

Auburn and Brunswick, Me.—Color, white; 98% thru 140 mesh bulk	19.00
Buckingham, Que.—Color, white; analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white; bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% through 60 mesh, bags	16.00
96% thru 150 mesh, bags	30.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Erwin, Tenn.—Color, white; analysis, 12.07% K_2O, 19.34% Al_2O_3; Na_2O, 2.92%; SiO_2, 64.76%; Fe_2O_3, .36%; 98.50% thru 200 mesh, bags, 16.90; bulk	15.50
Glen Tay Station, Ont., color, red or pink; analysis: K_2O, 12.81%, crude (bulk)	7.00
Keystone, S. D.—Prime white, bulk (crude)	8.00
Los Angeles, Calif. — Color, white; analysis, K_2O, 12.16; Na_2O, 1.53; SiO_2, 65.60; Fe_2O_3, .10; Al_2O_3, 19.20; crude	11.00
Pulverized, 95% thru 200 mesh; bags, 22.00; bulk	20.00
For glass manufacturers — (F. o. b. C.L., sacks included): Grade A: Analysis, Al_2O_3, 19.20; Fe_2O_3, .10—	20.48
Grade B: Analysis, Al_2O_3, 18.94; Fe_2O_3, .10	18.33
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—Color, white; crude, bulk	8.00
Ground, bulk	16.50
Spruce Point, N. C., and Bristol, Tenn.—Color, white; 90% thru 200 mesh, bulk	12.50@20.00
Tenn. Mills—Color, white; analysis K_2O, 18%; Na_2O_3, 10%; 68% SiO_2; 99% thru 200 mesh; bulk	18.00
99% thru 140 mesh, bulk	16.00
Topsham, Me.—98% thru 140 mesh, bulk	19.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton Mich. (limestone) per ton	10.00
Belfast and Rockland, Me.—(Limestone), bags, per ton	‡10.00
Brandon and Middlebury, Vt., per ton	10.00
Cartersville, Ga.—(Limestone), per bag	2.00
Centerville, Iowa (gypsum) per ton	18.00
Chico, Texas (limestone), 100 lb. bags, per ton	8.00@ 9.00
Danbury, Conn. (limestone), bulk	6.00@ 7.00
Easton, Penn.—Per ton, bulk	3.00
Joliet, Ill.—(Limestone), bags, per ton	4.50
Knoxville, Tenn.—per bag	1.25
Los Angeles, Calif. (feldspar) per ton	15.00
Gypsum, Ohio.—(Gypsum) per ton	10.00
Limestone, Wash. (limestone) per ton	12.50
Rocky Point, Va. (limestone) 100 lb. bags, 50c; sacks, per ton, 6.00 bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	12.00
Warren, N. H.—(Mica) per ton	3.85@ 3.90
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.—(Limestone) bulk	‡7.50@*9.00
Wisconsin Points (limestone) per ton	9.00

*L.C.L. †Less than 5-ton lots. ‡C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	10.00@11.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50@13.00b
Boston, Mass.	*17.00
Brighton, N. Y.	*19.75
Brownstone, Penn.	11.50@12.00
Dayton, Ohio	12.00@13.50
Detroit, Mich.	*17.50
Farmington, Conn	13.00
Grand Rapids, Mich.	12.00
Hartford, Conn.	*19.00
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	8.00@15.00
Lancaster, N. Y.	12.50
Madison, Wis.	a12.50
Michigan City, Ind.	11.00
Milwaukee, Wis.	*13.00
Minneapolis and St. Paul, Minn.	10.00
Minnesota Transfer	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.00@13.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	*19.75
Saginaw, Mich.	13.00
San Antonio, Texas	16.00
Sebewaing, Mich.	12.00
Sioux Falls, S. Dak.	13.00c
Syracuse, N. Y.	18.00@20.00*
Toronto, Canada	11.75
Wilkinson, Fla.	10.00@12.00
Winnipeg, Canada	*15.00

*Delivered on job. †Delivered in city.
‡Less 5%. ¶Dealers' price. (a) Less .50 E.O.M. 10 days. (b) Delivered to Milwaukee. (c) Delivered at yard.

Portland Cement

Prices per bag and per bbl, without bags net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.	.....	2.35
Baltimore, Md.	.....	2.25
Birmingham, Ala.	.....	2.30
Boston, Mass.	.....	2.23
Buffalo, N. Y.	.....	2.30
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	.....	2.24
Charleston, S. C.	.....	2.35
Cheyenne, Wyo.	.82¾	3.31
Cincinnati, Ohio	.....	2.32
Cleveland, Ohio	.....	2.24
Chicago, Ill.	.....	2.05
Columbus, Ohio	.....	2.29
Concrete, Wash.	.....	2.35
Dallas, Texas	.....	2.10
Davenport, Iowa	.....	2.24
Dayton, Ohio	.....	2.33
Denver, Colo.	.66¼	2.65
Detroit, Mich.	.48¾	1.95
Duluth, Minn.	.....	2.04
Houston, Texas	.....	2.60
Indianapolis, Ind.	.....	2.19
Jackson, Miss.	.....	2.60
Jacksonville, Fla.	.....	2.20
Jersey City, N. J.	.....	2.13
Kansas City, Mo.	.....	1.92
Los Angeles, Calif.	.62½	2.70
Louisville, Ky.	.54¼	.....
Memphis, Tenn.	.....	2.60
Milwaukee, Wis.	.....	2.20
Minneapolis, Minn.	.....	2.22
Montreal, Que.	.....	1.36
New Orleans, La.	.....	2.20
New York, N. Y.	.....	2.03
Norfolk, Va.	.....	2.17
Oklahoma City, Okla.	.....	2.46
Omaha, Neb.	.....	2.36
Peoria, Ill.	.....	2.22
Philadelphia, Penn.	.....	2.21
Phoenix, Ariz.	.81½	3.26
Pittsburgh, Penn.	.....	2.04
Portland, Colo.	.....	2.80
Portland, Ore.	.62½	2.50‡
Reno, Nevada	.....	2.91
Richmond, Va.	.....	2.40
Salt Lake, Utah	.70¼	2.81
San Francisco, Calif.	.....	2.21
Savannah, Ga.	.....	2.50
St. Louis, Mo.	.....	2.05
St. Paul, Minn.	.....	2.22
Seattle, Wash.	.....	2.50*
Tampa, Fla.	.....	2.25
Toledo, Ohio	.....	2.20
Topeka, Kans.	.....	2.41
Tulsa, Okla.	.....	2.33
Wheeling, W. Va.	.....	2.12
Winston-Salem, N. C.	.....	2.78

NOTE—Add 40c per bbl. for bags.
†Delivered on job in any quantity, sacks extra.
‡Less 5c bbl. 10 days.
*Ten cents discount for cash, 10 days. (a) Price includes sacks.

Mill prices f.o.b. in carload lots, without bags to contractors.

	Per Bag	Per Bbl
Buffington, Ind.	.....	1.80
Chattanooga, Tenn.	.....	2.45*
Concrete, Wash.	.....	2.35
Davenport, Calif.	.....	2.05
Detroit, Mich.	.....	2.15
Hannibal, Mo.	.....	1.85
Hudson, N. Y.	.....	1.95
Leeds, Ala.	.....	1.95
Mildred, Kans.	.....	2.35
Nazareth, Penn.	.....	1.95
Northampton, Penn.	.....	1.85
Richard City, Tenn.	.....	2.05
Steelton, Minn.	.....	1.85
Toledo, Ohio	.....	2.20
Universal, Penn.	.....	1.80

*Including sacks at 10c each.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ¼x32x 36", Wt. 1500 lb. Per M Sq. Ft.	⅜x32x 36", Wt. 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48", Lgths. 6'-10', 1850 lb. Per M Sq. Ft.
Arden, Nev. and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Ia.	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	8.00	.....	8.25@9.40	.....	.....	.14½s	.15½s	40.00@41.0
Douglas, Ariz.	.....	.....	6.00	.....	.....	.....	15.00	.....	40.00	13.50	35.00	45.00	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio	3.00	4.00	6.00	8.00	9.00	9.00	20.00	7.00	27.00	19.00	.....	15.00	30.00
Los Angeles, Calif.	.....	.....	7.50y	11.50y	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	11.65m	13.40r	14.40r	.....	15.40r	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.40	11.00	11.00	13.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
*To 3.00; †to 11.00; ‖to 12.00; ‡prices per net ton, sacks extra; (a) to 25.00; (b) net; (c) gross; (d) hair fibre; (f) delivered; (h) delivered in six states; (i) delivered on job; (k) sacks 12c extra, rebated; (m) includes paper bags; (o) includes jute sacks; (r) including sacks at 15c; (s) per board; (t) to 16.50; (u) includes sacks; (v) F.O.B. N. Y. C. and dealer's yard in mill locality; (x) Hardwall plaster; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City of shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	.16@.18a	.....	.....
Detroit, Mich.	.16	.....	.18
Forest Park, Ill.	18.00*	23.00*	30.00*
Grand Rapids, Mich.	15.00	.....	.....
Graettinger, Iowa	.18@.20	.....	.....
Indianapolis, Ind.	.13@.15†	.....	.....
Los Angeles, Calif.¶	5¾x3½x12—55.00	7¾x3½x12—65.00	
Oak Park, Ill.	18.00	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.20@.25	.....	.....
Tiskilwa, Ill.	.16@.18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton.

Cement Roofing Tile

Prices are net per sq. in carload lots, f.o.b. nearest shipping point unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00

Chicago, Ill.—per sq. 20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red and Orange	Green Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35
*End bands	.25	.35
*Eave closers	.06	.08
*Ridge closers	.05	.06

*Used only with Spanish tile.
†Price per square.

Houston, Texas.—Roofing Tile, per sq. 25.00

Indianapolis, Ind.—9x15-in. Per sq.

Gray	10.00
Red	11.00
Green	13.00

Waco, Texas: Per sq.

4x4	.60

Cement Building Tile

Cement City, Mich	Per 1000
5x8x12	55.00
Detroit, Mich.	Per 100
5x4x12	4.50
5x8x12	8.00
Longview, Wash.	Per 1000
4x6x12	52.00
4x8x12	64.00
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Grand Rapids, Mich.:	Per 100
5x8x12	7.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone-Tile)	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.—8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile)	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.	14.00 22.50@27.00
Yakima, Wash.—Building tile:	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa—5 to 36 in., per ton	8.00
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Longview, Wash.	18.00	25.00@75.00
Milwaukee, Wis.	15.00	28.00@50.00
Mt. Pleasant, N. Y.		14.00@23.00
Oak Park, Ill.	25.00	40.00
Omaha, Neb.	18.00	30.00@40.00
Pasadena, Calif.	10.00	
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50@19.50	25.00@75.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	23.00
Rapid City, S. D.	18.00	25.00@80.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	

†Gray. ‡Red.

Recent Contract Prices for Rock Products

FOLLOWING are some recent contract prices and prices bid on sand, gravel, stone, and other rock products:

Portland, Ore.—Contract for furnishing 5000 cu. yd. of crushed and screened pit run gravel was awarded to the Bell Sand and Gravel Co., for 50 cents per cu. yd.

Erie, Penn.—Contract for 2,000 tons of gravel went to the Nickel Plate Sand and Gravel Co. at $1.15 per ton in carload lots and $1.30 if delivered at some central loading station.

Charleston, W. Va.—State Highway Project 3098. Lincoln county, purchase of 22,000 cu. yd. of gravel f.o.b. cars at Huntington, Huntington Gravel and Supply Co., $78,305 (or $3.54 per cu. yd.).

Salem, Ore.—Six bids were submitted to the city for furnishing cement, sand and gravel for street work, according to M. Poulsen, city recorder. They were:

Spaulding Logging Co., Salem—Cement, $3.38 per bbl., jute bags; $3.18 per bbl., paper bags.

Salem Sand & Gravel Co., Salem—Cement, $3.38 per bbl., cloth sacks.

Oregon Gravel Co., Salem—Cement, $3.38 per bbl., cloth sacks.

Salem Sand & Gravel Co.—Sand, $1.94; gravel, $1.44; mixed, $1.75.

Oregon Gravel Co.—Sand, $1.94; gravel, $1.44; mixed, $1.75.

Portland Gravel Co., Portland—Sand, $1.70; gravel, $1.20; mixed, $1.60.

C. K. Spaulding Logging Co., Oregon Gravel Co., Salem Brick and Tile Co., submitted bids for furnishing 13,600 ft. of cement sewer pipe to the city this week. The contracts will be awarded March 7.

Their figures were:

C. K. Spaulding Log. Co., Salem—

6-in. pipe	$0.21
8-in. pipe	.30½
10-in. pipe	.42
12-in. pipe	.44
15-in. pipe	.79

Oregon Gravel Co., Salem—

6-in. pipe	$0.17½
8-in. pipe	.24½
10-in. pipe	.34
12-in. pipe	.48
15-in. pipe	.70

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted.

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Graettinger, Iowa	.04½d	.05½	.08½	.12½	.17½	.....	.40	.50	.60	.70	.....	.....	.....	.....	.....	.....	—
G'd Rapids, Mich. (b)																	
Culvert pipe	.....	.....	.....	.60	.72	1.00	1.28	1.60†	.....	1.92	2.32	3.00	4.00	.....	7.00	.....	.....
Sewer pipe (d)	.....	.....	.....	.....	.....	.63	.....	.60†	.....	.....	.....	.58	.....	.....	.....	.....	.....
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	†1.70	2.20	.....	.....	.....	.....	.....	.....	—
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	—
Longview, Wash.							Sewer pipe 40% off list, culvert—list										
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	—
Newark, N. J.							6 in. to 24 in., $18.00 per ton										
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.							12.00 per ton										
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	—
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	—
Tiskilwa, Ill. (rein.) (a)	.....	.....	.....	.65	.75	.85	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	—
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Yakima, Wash.								$10.00 per ton									

*30-in. lengths up to 27-in. diam., 48-in. lengths after; (a) 24-in. lengths; (b) Reinforced; (c) Interlocking bar reinforced. (d) Eastern clay list, 72% off.
†24-in. diam. ‡Price per 2 ft. length. (d) 5 in. diam. [1]@1.08 [2]@1.25. [3]@1.65. [4]@2.50. [5]@3.85. [6]@5.00. [7]@7.50.

Lousiana Portland Cement Buys Limestone Properties

ACCORDING to numerous press dispatches in southern newspapers, the International Cement Corp.'s New Orleans, La., subsidiary, the Louisiana Portland Cement Co., has acquired the limestone properties of the projected Santa Rosa Portland Cement Co. at St. Stephens, Ala. The newspaper reports state that nearly half a million dollars will be spent in developing these cement rock deposits and organizing a transportation system between St. Stephen's Bluff, Owen Bluff, Mobile and New Orleans by the Louisiana Portland Cement Co., which has purchased several hundred acres of land 70 miles above Mobile for exploitation. This announcement was made recently by Lewis R. Ferguson, manager at New Orleans for the Louisiana Portland Cement Co.

One measure, to be executed immediately, will be the construction of a fleet of barges and a towboat to operate on the Mobile and Tombigbee rivers between Owen Bluff and New Orleans. The first unit of the fleet, Mr. Ferguson said, will comprise six barges of 1200 tons capacity each and a Diesel engine propelled towboat.

Oyster-Shell Supply Limited

The purchase of the St. Stephen's Bluff quarry property was made after a careful survey of available limestone deposits. From unofficial sources it is understood that when the International Portland Cement Corp. selected a New Orleans site for its gulf subsidiary, it was planned to utilize what were supposed to be vast deposits of oyster shells in Louisiana waters. These deposits bid fair to be early exhausted because of the tremendous scale upon which operations are conducted, and as a result the company was faced by the need for limestone.

Early movements, it is estimated, will run from 12,000 to 12,500 tons of cement rock monthly, with a later increase to 25,000 tons monthly, all carried in the equipment of the Louisiana Portland Cement Co.

Machinery for the first units of the crusher plants will be sent to St. Stephens shortly. The equipment will reach Mobile by rail and will be transferred to a Warrior line barge. The Warrior barge line will participate in the general development, as it will freight 1000 tons of coal monthly from Barney, near Cordova, to the plant at St. Stephen's and Owen Bluffs.

A force of from 75 to 100 men will be employed permanently at the crusher plant. There will be an independent power unit to drive the machinery at the crusher and extraction plants.

During the Civil war, Owen Bluff was one of the most powerful fortifications on the river and there today are strewn Confederate cannon; in the river are the pilings which the Confederates hoped would halt the Federal river-boats.

It is understood that the leases on the property give the Louisiana company control of all the available cement rock deposits in this section of the state.

Doullut-Ewin, Inc., enginers and contractors of New Orleans, who have been doing the concrete pile work on the Mobile Bay bridge project and the concrete piers on the state docks here, have been awarded the contract for construction of all concrete work and piling at St. Stephen's, Ala., for the cement company.

Building Supply Dealers Protest Cement Imports

THE New England Builders Supply Association, in convention at Boston, February 9, adopted a resolution opposing the use of imported cement in public buildings and road construction in New England.

The committee in presenting the cement resolution pointed out that more than 10,000,000 bbl. of foreign cement have been imported, duty free, into the United States in the last four years, representing a loss to American industries of over $32,000,000.

Progress on Florida Cement Plant at Tampa

THE opening of a large rock quarry seven miles northwest of Brooksville and a clay pit a short distance south of that city, to supply raw material for the manufacture of portland cement at Tampa by the new plant of the Florida Portland Cement Co., is now definitely under way. Included in this development work is the construction of five miles of railway from the rock quarry to the main line of the Seaboard Air Line railway. The development of these raw material properties will involve the expenditure of about $200,000.

So far most of the work has been confined to clearing. The clay pit has already been cleared and stripping commenced. At the rock quarry, which covers an area of 520 acres, the ground has been cleared and several buildings, including one for dynamite storage, are being erected.

Both pits will be equipped with steam shovels. The rock quarry will also have a 50-ton steam locomotive. Twelve carloads of clay and 35 carloads of rock can be handled daily by this equipment. The big Tampa plant will require 375,000 tons of this raw material each year—and it is estimated that the Brooksville properties of the company contain enough to last 100 years.

Before the Florida Portland Cement Co. decided to advance its project, it made a thorough inspection of its territory and of the available supply of material. The United States Geological Survey has long known that Florida had rock and clay deposits suitable for the manufacture of cement, but the company spent eight months in investigation before purchasing the Brooksville properties.

A carload of rock and clay was sent from these deposits to a plant controlled by the Cowham Engineering Co. at Cement City, Mich., where a complete run was made to test the physical properties of the material, after chemical properties had been proved in laboratory tests. All tests have shown that the quality of cement produced was much higher than was necessary to meet requirements of the United States Bureau of Standards and specifications of the American Society for Testing Materials.

Asphalt Competition Defeats Move to Protect Home Cement Industry

FOLLOWING is an editorial from the *Portland* (Ore.) *Telegram:*

A meritorious bill was defeated by a ruse in the house yesterday afternoon.

The measure was H. B. No. 356 and the ruse employed the "black top" cry.

The bill in question provided that all cement imported into the state by water should be delivered in unbroken jute or cotton waterproof, paper-lined sacks, sealed at the cement mill.

Within the last few years Oregon's cement industry has grown to such proportions that it is now classed as one of the big industries of the state.

Its three plants have a capacity of approximately 2,000,000 bbl. a year, which is more than is consumed within the state.

In the last year or so, however, the industry has been subjected to merciless competition from foreign cement, much of which is imported as ballast. The result has frequently been that the home plants have been compelled to close down and labor found itself without employment. Moreover, much of this foreign cement en route absorbs water and has to be reconditioned at the expense of the contractor or purchaser.

In addition to protecting labor from being thrown out of employment, the measure was further designed to protect longshoremen handling the foreign product from cement poisoning. For years the State Federation of Labor has advocated the enactment of legislation providing for dustproof sacks that would protect and safeguard life from this deadly poison, and it was solidly back of the measure defeated.

But instead of being considered on these meritorious features, the bill was made the victim of "black top" propaganda planted in the house, when as a matter of fact it had no relation whatever to "black top" or any other type of pavement.

The argument was also raised that the measure would have the effect of increasing the price of cement. This argument was not only without a sound basis, but absurd. The requirement that foreign cement shipped in by water should be delivered in waterproof, paper-lined sacks would at the most only add an additional 5 cents a sack to the foreign product. While this would serve as a measure of protection for the local industry, it would in no wise increase the price of the local product.

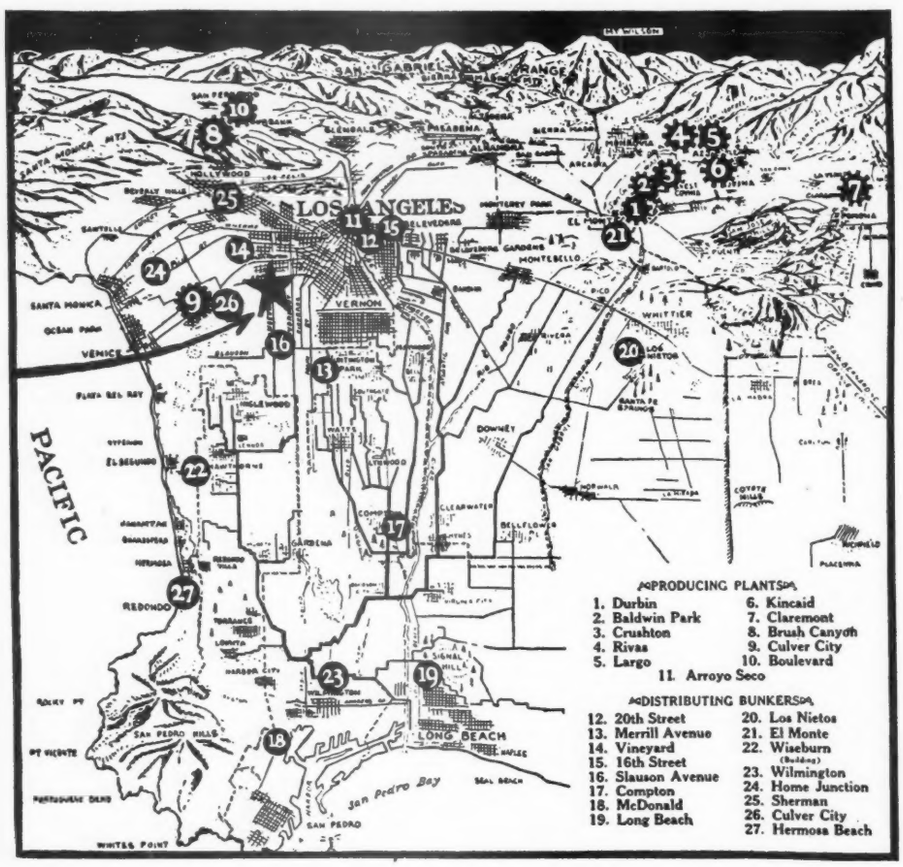
In view of the ruse and the false argument used to defeat the measure, its introducer, Representtive Olson, has signified his intention of asking the house to reconsider it. The *Telegram* not only hopes that the house will reconsider the measure, but also that the legislature will enact it into law. The best interests of both home industry and labor demand this particular piece of legislation.

Union Rock Company Expands

B. F. McGAFFEY, of the firm of Mayhugh-McGaffey Co., Inc., has announced the sale of the company's business, good will and plant equipment to the Union Rock Co., including the bunkers located at 3749 11th Avenue, Los Angeles, with about two acres of ground. The storage bunkers involved are modern in their mechanical equipment, and the company has been serving the construction industry for several years, its yearly business being about $300,000 per annum.

The company was established by A. B. McGaffey, H. S. McGaffey, B. F. McGaffey and Claude Mayhugh. In April, 1925, the latter sold out his interest in the company and the business was carried on by his father, A. B. McGaffey, and his sons, H. S. and B. F. McGaffey. The elder McGaffey is well known for his extensive lumber interests in New Mexico, and, although it has not been definitely announced, it is probable that his sons will become identified with him in the lumber business.

The addition of this plant to the long list of stations to the Union Rock Co. brings their total up to 28 service stations and adds an important link to the distributing system of the company, proving very valuable in providing a convenient delivery point for the building activity in the section surrounding the location of 11th Avenue and Exposition Boulevard. This new unit of the Union Rock Co. is now known as the Cienga bunkers and has taken its place in supplying the customers of the rock company. The Cienga bunkers are located practically equidistant from the Vineyard, Slauson and Culver City bunkers of the Union Rock Co.



Producing and distributing plants of the Union Rock Co., Los Angeles, Calif. The arrow points to the location of the Mayhugh-McGaffey company plant recently acquired and which is not included in the list of distributing points on the map

New Sand and Gravel Plant for Northern New York

THE new Lacona Sand and Gravel Co., which recently incorporated, offices of which are located in Watertown, N. Y., has started the construction of a modern plant at Lacona, N. Y.

The company is incorporated for $50,000. There are to be issued 500 shares of common stock of no par value. The officers of the company are Stewart D. Ormsby, Watertown, president; Harry J. Yoder, Watertown, vice-president, and C. Mae Ormsby, secretary and treasurer.

About $40,000 is to be spent in the construction of a modern electrically operated plant at Lacona. The company has a long-term lease on about 75 acres of the best country in the northern part of the state. It is estimated that there are more than 2,000,000 yd. of sand in sight.

Foundations for the new plant have already been constructed and it is expected that everything will have been completed and the plant in operation by May 1. It will be capable of turning out 2500 yd. of washed sand a day, but when it is first opened only about 500 yd. will be produced.

About six men will be employed at the plant when it is in full operation. The territory in which the products of the new company are to be sold extends from Utica to Syracuse, to Auburn, to Oswego, and all points to the lake and St. Lawrence river.

The sales department of the company will be located in Watertown. Mr. Ormsby, president, is also president of the Watertown Stone Products Co.

There will be two products of the new concern, washed sand and gravel. Tests of the washed sand have been sent to Albany and a report returned stating that the sand is of higher grade than is required for state road work.—*Watertown* (N. Y.) *Standard.*

Financing

An adequate supply of water for washing, location on the main line of the Ontario division, New York Central, cheap power from the high tension transmission lines of the Niagara, Lockport and Ontario Co., and plentiful labor from the nearby villages of Lacona and Sandy Creek are listed as advantages.

It is intended to use the proceeds from the sale of 500 shares of 7% cumulative preferred stock to finance the erection of the sand and gravel plant, construction of railroad siding and carrying on the business of the company, according to the announcement.

The interest of the stockholders will be protected, according to the company's announcement, by insurance on the life of S. D. Ormsby, same to be payable to the corporation to the extent of one-half the preferred stock outstanding.

The company estimates that the cost of the plant will be $40,000, of which $14,000 will be for the shovel. An estimate of the company's first year's business is placed at $60,000, with operating expenses of $33,600, and a gross profit of $26,400. A deduction of $3,500 for preferred stock dividends would leave for dividends and salaries $23,000.—*Oswego Journal.*

New Tennessee Sand and Gravel Project

FINAL plans and arrangements for a modern sand and gravel pit to be erected at Estill Springs, Tenn., have been completed. A charter has been applied for and directors elected as follows: Meade Frierson, president; W. H. Parrish, Jr., secretary-treasurer; W. L. Haily, manager; W. H. Wright and M. J. Cunningham. All the gentlemen except the last named are from Nashville, and Mr. Cunningham resides in Winchester, Tenn. The location of the plant is about 2½ miles from Estill Springs. It will be called the Estill Springs Sand and Gravel Co., with main offices Nashville, Tenn.

Construction Work Begun on Northwestern Cement Plant

THE Northwestern Portland Cement Co., as previously noted in these columns, was organized by a group of Oregon men headed by George Macdonald, formerly secretary-treasurer of the Oregon Portland Cement Co. and organizer and first vice-president and general manager of the Sun Portland Cement Co., and C. T. W. Hollister, formerly secretary and sales manager of the Oregon Portland Cement Co.

Other than the above the directors are: Joseph N. Teal, attorney; J. M. Dougan, president of the Dougan-Christman Co., general contractors, both of Portland; Dr. J. A. Reuter of The Dalles, director of the St. Helens Pulp and Paper Co.; John Hastie, president of the Sound Construction Co., general contractors; F. T. Crowe, president of F. T. Crowe & Co., Tacoma; Major H. K. Metcalf, horticulturist, Forest Grove, and James H. Nichols, attorney, Baker.

The company is capitalized at $1,000,000 and has acquired vast quarries of limestone and deposits of clay at Grotto, Wash., 49 miles east of Everett, where the cement plant will be located. Construction of trackage and other preliminary work already has been started on the plant, which will be located on a main line railroad, and it is planned to have the first unit of the factory in operation in September. The first unit will have a capacity of 1500 bbl. a day and additional units will be added to meet the demand for the product.

In announcing the plans of the company Mr. Macdonald said that the mill will be one of the most modern cement plants on the Pacific coast and that they have limestone and clay deposits necessary to operate the plant for 90 years.

"Among our largest stockholders are men who are stockholders in the Oregon Portland Cement Co. and also in the Sun Portland Cement Co.," he said. "I still retain my interest in the former company.

"Our headquarters offices will be maintained in Portland and our sales offices will be in Seattle. We are looking forward to a great demand for cement in the Northwest in coming years, due to the many big development projects in contemplation, and we will be in position to supply the demands."—*Portland* (Ore.) *Telegram.*

Contracts for structural steel have been awarded by the Northwestern Portland Cement Co. to the Pacific Iron Works, of Portland, for the machine shop, compressor house, sub-station, store building, office and laboratory of the company's cement plant at Grotto, Wash., on the main line of the Great Northern railway, 81 miles east of Seattle. All of these buildings will be of structural steel and it is planned to have cement on the market early this fall.

The company reports all but a small portion of its 8% preferred stock, carrying a common stock bonus, share for share, sold to Oregon and Washington investors, many of whom already have had profitable experience in investing in cement securities. The Northwestern company is issuing no mortgage bonds.

Yosemite Cement Plant To Produce in April

THE Merced plant of the Yosemite Portland Cement Corp. is expected to be in operation late in April, Superintendent George A. Fisher told the Rotary Club in Fresno, Calif., recently. A million dollars will be spent on the plant, and when completed its payroll will carry about 110 men at an average wage of $5 a day, or over $150,000 a month.

The expected output will be 2500 bbl. a day, Mr. Fisher said.

W. M. Palmer Elected President of Florida Lime Rock Association

THE annual meeting of the Florida Lime Rock Association convened at the Harrington Hall Hotel, Ocala, Fla., the week of February 7, and was well attended.

The Florida Lime Rock Association is composed of practically all producers of soft lime rock in the state. The object of the association is to promote further use of lime rock throughout the state, and to create a friendly feeling among the members.

The association is a strictly Florida enterprise, fostering a Florida product and manned by Florida officers; therefore the growth and expansion of the industry means growth and expansion for the state of Florida as well as for the various allied industries.

There has been during the past year an appreciation of this fact on the part of various boards of county commissioners, contractors and municipalities in specifying Florida lime rock for their miscellaneous construction programs, the product being recognized by the Federal Bureau of Public Roads as a very high grade material for a base in the construction of highways and streets.

The association maintains offices in Jacksonville and Tampa, the Tampa office being in charge of John J. McCabe, 915 First National Bank Building, while the Jacksonville office is under the administration of Wallis Callaway, 1501 Barnett National Building.

The following officers were re-elected for the ensuing year: W. M. Palmer of the Commercial Lime Co. and the Dixie Products Co., Ocala, president; C. D. Schultz of the firm of Connell & Schultz, Inverness, vice-president; E. F. Fitch of the Marion County Lime Co., with headquarters in Jacksonville, vice-president; Carl G. Rose of the Ocala Lime Rock Co., Ocala, treasurer; Willis Callaway of Jacksonville, executive secretary.

The meeting was considered by the officials and members as a most enthusiastic one and resulted in a note of confidence for the further expansion and development of the association during 1927.

Lawrence Portland Cement Company To Proceed With Maine Project

A DEED was signed at Rockland, Me., February 15, conveying the property of the New England Portland Cement and Lime Co. to the Lawrence Portland Cement Co. of Siegfed, Penn. Included in this deed are 90-odd pieces of property, which consist not only of limerock quarries, farms and mineral lands, but a valuable section of the waterfront at the south end of Rockland harbor.

F. H. Smith, president of the Lawrence company, declined to state the sum involved in the purchase, but did offer the information that the proposed cement plant, when completed a year hence, will represent an investment of approximately $4,000,000. If it is necessary to install a waste-heat boiler plant for the creation of electrical energy, it will mean the expenditure of another half million, said Mr. Smith, and if it also means the construction of a dock so as to ship products by sea, it will mean $250,000 invested on top of that.

"We expect to break ground just as soon as weather conditions will permit, and during the year will erect about a dozen buildings, all of which will be of steel and concrete.

"The plant will be the last word in the way of cement construction and, while planned on the basis of producing a million barrels a year, will be capable of duplication so that twice that quantity could be produced.

"Charles A. Porter, operating vice-president of the Lawrence company, will have general supervision of the work, which will require the employment of about 200 men. The wet process of cement manufacture will be used and the plant will be practically dustproof," said Mr. Smith. "Our geologists have been all over the property and made innumerable borings and tests, with the result that we are assured of a supply sufficient to make 100,000,000 bbl. of cement, or to last 100 years on the basis of a million barrels a year plant."—*Boston* (Mass.) *Globe.*

Correction

ON page 46 of the February 19 issue of ROCK PRODUCTS in the story of recent improvements in the Edison Portland Cement Co.'s plant, it is stated that the turbo-generator driven by steam from the waste heat boilers was made by the General Electric Co. This is an error, as the turbo-generator set was made by the Westinghouse Electric and Manufacturing Co. This unit is rated at 6250-k.v.a. at 3-phase, 60-cycles, 2400-volts. It operates at 3600-r.p.m.

New Machinery and Equipment

New One-Half Yard Shovel

THE Byers Machine Co., Ravenna, Ohio, has recently brought out Model 27-R, a half-yard, rope-crowd shovel for stripping, car loading and other work in all positions except where a full-revolving type is required.

The length of boom, dipper stick and size of bucket follows standard practice for machines of this type. The boom is of steel and is of the box girder type construction. The dipper stick is of the double type, working in double saddle block outside of the boom, and is made of oak timber armored with steel plates. The boom foot and the hinge casting at the end of the dipper stick are of steel.

The rope crowd is accomplished by means of a drum actuated by clutches at each end, each of which operates the drum in the opposite direction. The two clutches are operated by one lever and the operation is standard, with three levers and one foot brake. An extra brake is provided to assist in holding the dipper stick in any position as well as for the back drum when some other attachment is used.

This crowd is said to be extremely sensitive, easily operated, fast, positive in action, and capable of being operated by itself alone.

The bucket is said to be of good design with a capacity of 85% of a half yard struck measure or a half-yard, heaped.

The standard attachments consist of skimmer, ditcher, clamshell and backfiller, all to fit the 27-R shovel without change and without the removal of any part of the mechanism.

One-half yard, full revolving power shovel

Scale Remover for Sand-Lime Brick Kiln Cars

JACKSON AND CHURCH CO., Saginaw, Mich., has recently brought out a portable car cleaner for removing scale from hardening cars used in sand-lime manufacture. Through the use of this machine, much of the brick breakage and poor brick caused by the uneven or rough tops on the platform or decks of the kiln cars is said to be cut down appreciably.

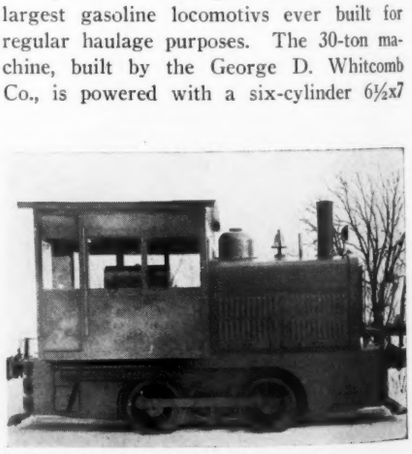
The "J-C" car cleaner is a portable grinder driven by a 2-hp. electric motor. The motor and grinding wheel or cup-shaped disk are mounted on a vertical shaft, the whole resting on a two-wheel truck. The weight complete, including the electric motor, is 450 lb. One man, the manufacturers say, can grind the scale off a train of kiln cars in 15 to 45 minutes, depending on the amount of scale present.

Since the removal of scale by hand tools is a very tedious process, the advantage of doing the work with a power machine is apparent, not to speak of the improvement in the product.

Electric kiln-car scale remover

New 30-Ton Gasoline Locomotive

AN eastern manufacturing company is reported to have purchased one of the largest gasoline locomotivs ever built for regular haulage purposes. The 30-ton machine, built by the George D. Whitcomb Co., is powered with a six-cylinder 6½x7 Beaver engine whose rated capacity is given as 160-hp. at 1000 r.p.m. The drawbar pull is stated to be 17,500 lb. on low gear without sand.



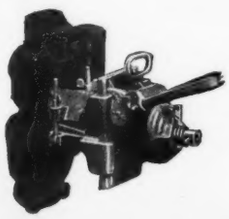
New 30-ton gasoline locomotive

The locomotive frame is of the solid type construction. The axles are of forged steel and the wheels furnished with chilled tread or of other desired types. Various speeds, both in forward or reverse, are possible, the

manufacturers say. Sand is furnished at all four wheels. In other respects, the machine is similar to the smaller sizes of Whitcomb gasoline locomotives.

New Pinion Puller

A NEW pinion pulling device has been recently brought out by the Duff Mfg. Co., Pittsburgh, Penn., for use wherever geared machinery is employed. While originally developed for pulling pinions, the manufacturers say, the device can be quickly



Device for pulling pinions

and economically adapted to the removal of pulleys, pumps, small flywheels and other from various shafts.

Some of the advantages claimed for the device are—the quick "run-out" for rapidly bringing the end of the screw into contact with the pinion shaft, uniform pull around the entire periphery of the pinion and the great force exerted by the worm and screw action which makes it unnecessary to resort to tapping the end of the screw.

The housing and jaws of the machine are of electric steel castings and the worm and screw case hardened steel. Ball bearings are used throughout. A 28-in. steel pinch bar operating handle is furnished with the device as standard equipment.

New Light Excavator

THE Harnischfeger Corp., Milwaukee, Wis., has just brought out a new, small, light excavator of ½-cu. yd. capacity, called Model 300. These machines are built specially for small jobs, where short tail swing, ability to travel in close quarters, power and speed are deciding factors. It can be used with the following attachments: shovel, dragline, clamshell, crane pile driver or magnet. For clam service, etc., it is equipped with a 30-ft. boom. Like the larger P&H models, this model is also equipped with power clutch control.

Another feature, the makers say, on this machine is the boom hoist braking system. In addition to a foot operated band brake and a pawl and ratchet for holding the boom in a fixed position, there is a lowering control load brake for prevention of boom dropping. The corduroy construction is built along the same general lines as those on the larger models. The car body is of large proportions, braced, the traveling machinery being accessible. The revolving frame is a one-piece, annealed steel casting, extending from boom hinge to the extreme end of the machine.

New one-half yard excavator designed for small jobs

Machine-Made Drill Bits

THE chief advantage of machine made drill-steel bits over those made by hand for rock drilling is shown by an increase in over-all plant efficiency and economy. It must be recognized that putting in a drill hole is only the first of a series of interdependent operations, namely, blasting, rock removal, etc. Thus it is important that drilling proceed on schedule time so as not to delay the following operations and increase production costs.

The machine-made bit will, in the great majority of cases, drill faster and truer than the hand-made.

The cutting edge of the machine-made bit is sharp and concentric. The material back of it is dense, having been compacted by powerful hammer blows. The angle, of which the cutting edge is the apex, is correctly made so as to give the proper chipping blow. The clearance space between the wings of a machine-made bit are sufficiently wide to give ample room for rock cuttings to pass; and, at the same time, the wings are heavy enough to stand up under severe work. The wearing surfaces forged on the sides of the wings permit the drill to be used for a maximum time before losing its gauge and having to be removed from the hole and re-sharpened. The sharpener-made bit is symmetrical. Because of this there is much less likelihood of holes "rifling." The machine-made bit will drill a smooth, round hole. This is not always true of hand-made bits. All the foregoing reasons are important, but the principal reason for the greater drilling speed of a machine-made bit is that it does not have to cut so much rock, for more accurate bit gauging is possible by machine.

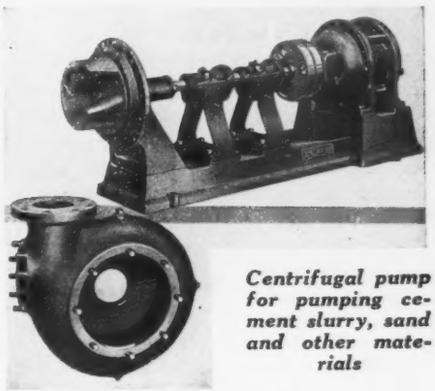
There is also to be considered the time element in sharpening; one man by machine being able, it is said, to form and sharpen from 3 to 10 times as many perfect bits as two men sharpening by hand. All factors taken into consideration, it has been found that the cost of machine-made bits is but one-third of those made by hand.

In short, good drill steels, with properly made bits and shanks, will contribute much to better plant operation. The drills will give maximum service; the holes will be drilled faster; and the blasting, mucking, hoisting, and other work will be carried out on schedule time while the efficiency of the entire plant will be increased proportionately. —*D. E. Dunn* in *Ingersoll-Rand News Service.*

New Centrifugal Pump

THE American Well Works, Aurora, Ill., has just placed on the market their non-clogging centrifugal pump. The design of this pump is said to mark a new departure in construction which obviates the necessity of screens and their maintenance.

The single blade impeller in the pump



Centrifugal pump for pumping cement slurry, sand and other materials

is so designed that the stream lines are not separated; the stream of fluid is kept in one mass and carried through the pump without being subdivided. By compelling all the liquid and debris to be discharged through a single peripheral passage, the manufacturers say that the possibility of different portions of a single piece of debris being swept into different outlet passages and thereby being hung up within the impeller is avoided. This precludes screening sewage or fluid containing other material before pumping.

Where particularly designed for handling fluids containing foreign matter such as debris, shavings, etc., its use is not restricted to this, but can be adapted to the pumping of fluids containing heavy materials such as cement slurry, sand, etc. The present design includes both the horizontal and vertical types.

New "V" Type Rubber Belt

A PATENT has been recently issued the B. F. Goodrich Co., Akron, Ohio, covering the construction and method of making rolled endless belts of the side-driving type from vulcanized rubber and fabric. The belts are made both in the round and "V" sections, either with or without a reinforcing core.

Cost Analysis of Cement Material Handling

Results of a Survey Made at the Aetna Portland Cement Co., Bay City, Mich., on Traveling Cranes Equipped with 2½-yd. Clam-Shell Buckets

THE Aetna Portland Cement Co. handles stone, clay, coal and clinker at its new Bay City, (Mich.) plant with three Whiting bucket cranes, installed in 1922 at the time the plant was constructed. They went into service in 1923 and are now in their third year of operation.

The average 30-day production of this plant is 70,000 bbl. of cement, and the total crane cost is $0.043 per bbl. Rock and clay are handled into and out of storage piles for $0.034 a ton; clinker for $0.044 a ton; and coal for $0.053 a ton.

Crane Equipment

The cranes are identical in design. This gives interchangeability of parts and allows a minimum reserve stock to be carried. Rated capacity is 15 tons per crane and each is equipped with a 2½-yd. clam-shell bucket. Bridges have a 100-ft. span and the ways are built up to give a clearance of 45 ft.

Sixty-horsepower motors are provided for hoist, bridge and trolley and the rack motor is of 15-hp. capacity.

Storage Layouts

Rock and Clay. Rock is received in company-owned ships and delivered to the dock by an unloader which deposits it at one end of a storage yard.

Clay is brought in by rail on a siding at the opposite end of the yard and is taken directly from cars by the rock and clay crane.

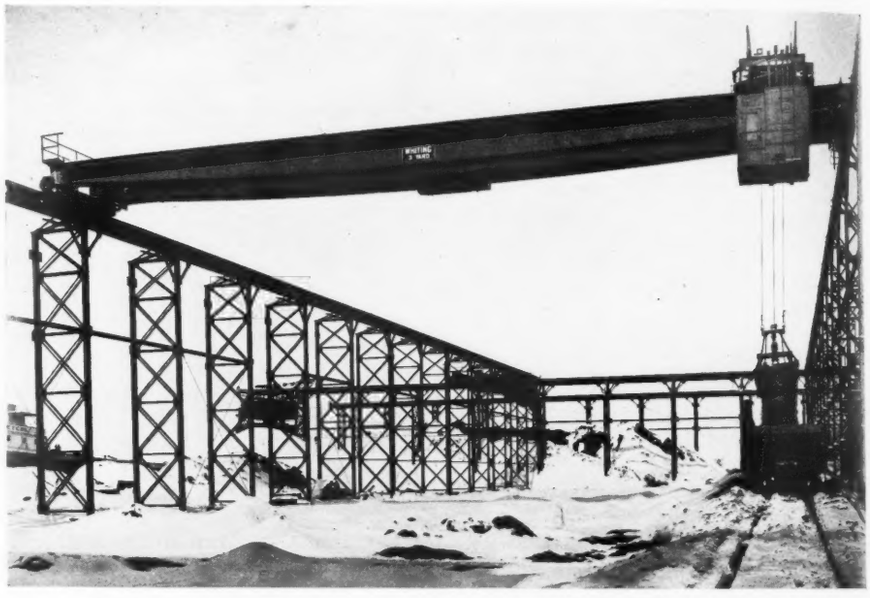
The crane-way over the storage yard is 100 x 500 ft., and extends at right angles to the water front. Clay is stored only in small quantities, but rock is often accumulated in amounts up to 100,000 tons as a reserve against the period during which navigation is closed.

The rock and clay crane is in use 24 hours a day. The distribution of rock and clay to suitable storage piles and the reclamation of the material for transport to the plant is easily handled by two operators, each on a 12-hour shift.

Clinker. Clinker is stored under a crane-way 260 ft. long. Hot clinker coming from the towers is distributed and later reclaimed. The capacity of this yard is 90,000 bbl. of clinker and the crane used to handle this material is in use about 19 hours a day.

Coal. Coal is received in gondola cars on a siding near the rock and clay storage area. The crane-way serving the coal yard is 100 x 350 ft.

The third Whiting crane, in operation about five hours a day, takes nut, pea and slack coal from the cars, distributes it to proper storage piles and later reclaims the coal for delivery to pulverizer.



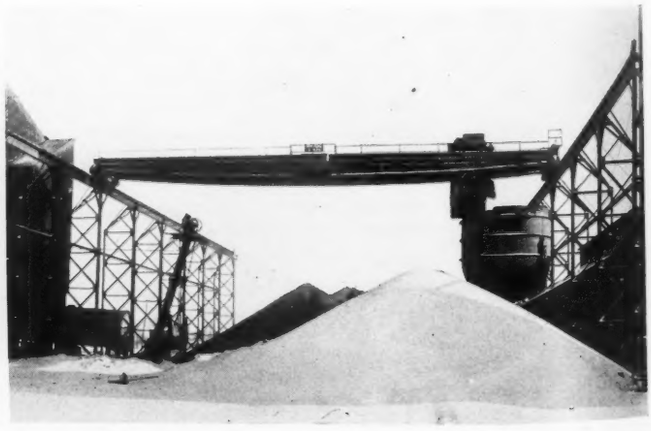
Close-up of the bucket crane used to unload, distribute and reclaim coal

Daily Operating Costs

Tabulations following detail the daily and unit crane costs. The total first cost of the three Whiting units was $35,000 exclusive

Survey made by A. C. Nielsen Co., engineers, in collaboration with and approved by George Fay, plant superintendent of the Aetna Portland Cement Co., Bay City, Mich.

Bucket crane in foreground handles coal and that in the rear is for rock and clay



Overhead crane equipped with 2 1/2-yd. clamshell bucket distributing and reclaiming clinker

of runways. This gives a first cost of $11,666.67 per crane. Depreciation and average interest on this cost, figured for a 10-year life, total $1551.67 per year or $5.17 per crane per day.

Repair parts purchased from the Whiting Corporation in 1926 have totalled less than $500 for all cranes. The allowance of $1,000 per year is therefore very liberal.

Repair labor cost is figured as the total of one man's time for 300 ten-hour days at $0.70 an hour. The maintenance policy at this plant is to keep all equipment in first-class condition continuously, correcting the effects of ordinary wear before any serious failure can occur.

Repair and maintenance costs have been pro-rated to the three cranes on the basis of their hours in service. Labor and material costs are shown as separate items on the basis of a 300-day year.

Power has been estimated at 75 kw. per crane and is charged at the rate of $0.015 per kilowatt-hour.

With labor the daily totals are as follows:

Rock and clay crane	$ 48.14 a day
Clinker crane	39.20 a day
Coal crane	14.13 a day
Total, all cranes	$101.47 a day

Unit Material Handling Costs

The second tabulation below shows the unit crane costs of material handling. The quantities of the various materials handled are based on an average 30-day run during which 70,000 bbl. of cement are normally produced.

Rock and clay, totalling 1,433 tons a day is handled to and from storage for $0.034 a ton. Clinker, averaging 886.7 tons a day is handled for $0.044 a ton. Coal—266.7 tons a day—shows a crane cost of $0.053 a ton.

On the basis of a total crane cost of $101.47 a day, the unit cost per bbl. of finished cement is $0.043.

Operating Cost of Three 2½-Yd. Bucket Cranes

Annual Fixed charges (Per crane)		
Depreciation—$11,666.67 ÷ 10-year life		$1,166.67
*Average interest @ 6%—11/10×$11,666.67×0.06/2		385.00
Total annual fixed cost		$1,551.67
Daily fixed charge—$1,551.67 ÷ 300 days		$ 5.17
Daily Operating Costs, Rock and Clay Crane		
Fixed costs	$ 5.17	
Repair and maintenance (pro-rated) material	1.67	
Labor	3.50	
Power—75 kw. × 24 hrs. @ $0.015	27.00	
Labor—24 man-hours @ $0.45	10.80	
Total daily operating cost		$ 48.14
Clinker Crane		
Fixed costs	$ 5.17	
Repair and maintenance (pro-rated) material	1.32	
Labor	2.78	
Power—75 kw. × 19 hours @ $0.015	21.38	
Labor—19 man-hours @ $0.45	8.55	
Total daily operating cost		$ 39.20
Coal Crane		
Fixed costs	$ 5.17	
Repair and maintenance (pro-rated) material	.35	
Labor	.73	
Power—75 kw. × 5 hours @ 0.015	5.63	
Labor—5 man-hours @ $0.45	2.25	
Total daily operating cost		$ 14.13

*Allowing for interest earned by depreciation reserve.

Daily Crane Costs and Unit Material Handling Costs for Average 30-day Run of 70,000 bbl. Cement

Daily Crane Costs (preceding tabulation)		
Rock and clay crane		$ 48.14
Clinker crane		39.20
Coal crane		14.13
Total daily crane cost		$ 101.47
Unit Handling Costs, Rock and Clay		
Rock	17,000 tons	
Clay	4,500 tons	
Total	21,500 tons	
Daily handling—21,500 × 2 handlings ÷ 30 days	1,433 tons	
Handling cost, per ton—$48.14 ÷ 1,433 tons		$ 0.034
Clinker		
Tonnage	13,300 tons	
Average handling per day—13,300 × 2 handlings ÷ 30 days	886.7 tons	
Handling cost per ton—$39.20 ÷ 886.7 tons		$ 0.044
Coal		
Tonnage	4,000 tons	
Average handling per day—4,000 × 2 handlings ÷ 30 days	266.7 tons	
Handling cost per ton—$14.13 ÷ 266.7 tons		$ 0.053
Crane cost per barrel of cement—$101.7 ÷ (70,000 bbl. /30 days)		$ 0.043

*Allowing for interest earned by depreciation reserve.

Testing of Explosives by Photographic Methods

AN INVESTIGATION to determine by photographic methods the effect of the physical and chemical properties of explosives on the flames produced, and the influence of different methods of loading and different kinds of stemming on the character of the flame, together with the relation of flame properties to the limit charge as determined in a testing gallery, is being conducted by the Bureau of Mines, Department of Commerce, at Pittsburgh, Penn.

Photographs on a rapidly moving film have shown that secondary flames are produced by most explosives when an air space exists between explosive and bore-hole or between explosive and stemming. Photographs on a fixed plate have shown coal-dust stemming to produce a large bright flame, much larger than with fire-clay stemming, and that addition of water to ordinary dry fire-clay stemming reduces size of flame. Results are in qualitative agreement with gallery tests.

The purpose of another investigation being conducted at Pittsburgh is to determine the mode of ignition of gas and dust by a charge of explosive fired into a steel gallery. The gallery contains a horizontal slot covered by plate glass windows through which the flames may be photographed on a rapidly moving film. The gallery has been constructed and a camera designed and built which has a 6-in. drum capable of revolving at peripheral speeds up to 50 meters per second. It is hoped by means of this apparatus to obtain more definite knowledge as to the mechanism of mixtures of air with gas or coal dust.

Another study undertaken is for the purpose of determining the rate of detonation of explosives by a new method, namely, photography of a detonating column of explosive on a rapidly moving film. Rates of detonation of typical mining explosives have been determined by this method, and the propagation of the shock wave over an air gap between two cartridges also has been studied.

Modern Grinding Practice

OPERATORS who use ball mills will find quite a number of interesting facts in a new bulletin, "Operation Notes for Ball Mill Users," recently gotten up by the Hardinge Co., York, Penn. Therein are listed among other things the factors involved in the proper operation of this type of mill, such as character of material, capacity, moisture, mill speed, open and closed circuit grinding, size and quantity of balls, and others. These are all carefully analyzed and classified according to their effects upon the efficiency of the system. The bulletin also gives capacity tables for conical mills using balls or pebbles as grinding media.

News of All the Industry

Incorporations

Shelburne Quarries, Ltd., Toronto, has been incorporated with a capital of $300,000.

Monument Washed Sand and Gravel, Inc., Freehold, N. J., $100,000. To quarry sand, gravel, etc.

Sinclair Marble and Stone Co., St. Louis, Mo., $40,000. Geo. A. Sinclair, 400a E. Davis St.

Pyramid Stone Co., Houston, Texas, $20,000. W. T. Carter, 1201 Capitol St.

Ozark Valley Mining Co., Wilmington, Del., $150,000. To deal in minerals of all kinds.

Capital Duntile Manufacturing Co., Inc., Hyattsville, Md., $20,000. Raymond M. Lange.

Southern MacTile Co., Asheville, N. C., $50,000. Frank M. Weaver, 32 N. Lexington Ave.

Pioneer Rock Asphalt Co., $500,000. S. L. Mackey, Wilmington. (Corporation Service Co.)

Bender Service Co., Wilmington, Del., $100,000. To deal in stone, cement, gravel, etc.

R. K. Miller Minerals Corp., Wilmington, Del. $1,000,000. To deal in manganese ore, iron ore, ochre, barites, clay and all other such minerals.

Cliffside Crushed Stone Co., Amarillo, Texas. $50,000. R. S. Nelson, W. D. Burger, and Charles Nicholson.

K. D. S. Concrete Products Co., Griffith, Ind., $10,000. George E. Sloan, Davis Sloan, and Walter Kline.

Duntile Corp. of Florida, Orlando, Fla., $500,000. Earle A. Hoselton, James J. Rodgers, Gladys G. Rodgers, board of directors.

Ornalithic Stone Co. of Florida, Inc., St. Petersburg, Fla., $15,000. W. H. Ogle, 921 15th Ave., N.

United Rock Asphalt Co., Louisville, Ky., from $4,400,000 to $13,000,000; 40,000 to 100,000 shares, no par value stock. (Southern Trust Co.)

Huntington Sand and Gravel Co., Huntington, N. Y., $30,000. F. J. Munder, R. Scudder, M. G. Gavin. (Filed by I. R. Swezey, Huntington.)

Federal Portland Cement Co., Buffalo, N. Y., 30,000 to 40,000 shares, of which 20,000 are $100 each; 20,000 common, no par.

Ottmann Sand and Gravel Corp., Mount Vernon, N. Y., $25,000, divided into $100 shares. Frank A. Ottmann, Louis J. Ottmann, Clarence M. Brobst, Ernest R. Eckley.

Potters Supply Co., Ltd., Toronto, has been incorporated with a capital of $100,000 to carry on the business as manufacturers, producers and dealers in ceramic products and machinery.

France Limestone Co., Ohio corporation; $213,750; capital represented in Indiana. To deal in stone, gravel, etc. Agent for service of process, Charles W. McKee, Huntington.

Lacona Sand and Gravel Co., Watertown, N. Y., 500 shares, $100 each; 500 common, no par; H. D. and C. M. Ormsby, H. J. Yoder. (Filed by E. H. Bennett, Watertown.)

Keyroid Damp Proof Stone Corp., New York City, N. Y., 1000 shares, $100 each, 3000 common, no par. D. McPherson, F. B. Schutz, J. J. Connelly. (Filed by A. P. Loshen, Jamaica.)

United States Gypsum Co., Chicago, Ill., increased capital stock from $25,000,000 to $35,000,000. Scott, Bancroft, Martin, and MacLeish, 134 So. LaSalle St.

Detroit Material and Transportation Co., 200 Transportation Bldg., Detroit, Mich., $250,000. To own and operate boats, vessels, and docks, to deal in gravel, etc.

Continental Oil and Asphalt Co., New York City, N. Y., $2,000,000. S. L. Mackey, Wilmington. Gas, coal, rock, sand, gravel, and petroleum. (Corporation Service Co.)

National Inlaid Colored Cement Corp., Los Angeles, Cal. $100,000. George W. Brockus, Alhambra; C. W. Vincent, Garden Grove, and N. L. Cohen, Los Angeles.

Danforth Stone & Supply Co., Ltd., Toronto, has been incorporated with a capital of $40,000 to carry on the business of quarry masters, stone merchants and dealers in cement, lime, sand, etc.

Paris Sand and Gravel Co., Ltd., Paris, Ont., has been incorporated by Thomas S. Barbeau of Paris, contractor, and others, with an authorized capital of $100,000 to deal in sand and gravel, to carry on the business of quarry masters, etc.

New Boston Street Sand and Gravel Co., Woburn, Mass., $100,000, 1000 shares, $100 each. President, Benedetto Generagio; treasurer, Angelo De Angelis, 175 Maverick St., East Boston, and Wm. V. Hayden.

Standard Rock Asphalt Co., Bowling Green, Ky. $1,500,000. To develop rock asphalt deposits near Bowling Green, Ky. Directors: R. W. Woodruff, Atlanta, Ga.; E. A. McGuire, New York; E. W. Sinclair, New York, and others.

D-B Concrete Products Co., 77 W. Washington St., Chicago, Ill. $10,000. Thomas P. Dowdle, George C. Bartram, R. R. Dowdle, John J. Dowdle. To manufacture and deal in concrete pipe blocks, tile and other concrete products. Correspondent: Dowdle & Geary, suite 725, 77 W. Washington St.

Nelson Cement Stone Co., Inc., Quincy, Mass.; structural concrete and ornamental cast stone! $50,000; Albert P. Nelson East Braintree; Oberlin S. Clark and Raymond E. Stein, both of North Weymouth; Ernest G. Smith and Alexander A. McDonald both of Quincy.

Quarries

Southern Limestone Co., Harriman, Tenn., has completed the electrification of its plant. Hereafter power will be purchased from the Tennessee Electric Power Co. through a transmission built at a cost of approximately $8500.

Kelly Butte (Ore.) county-operated quarry is alleged to have made a profit of $493 in 1926, with a gross operating expense of $45,483 and a gross revenue of $45,977. All the rock produced was used by the county or sold to contractors on public works. A total of 30,061 cu. yd. of rock were quarried and crushed.

Elkin, N. C.—Plans are now being made to organize a company capitalized at $100,000 to develop a deposit of black granite recently found near Elkin, N. C. The deposit has been pronounced by Prof. A. F. Graves-Walker, of the North Carolina state college department of ceramic engineering and other experts to be one of the most valuable in the country. The deposit is said to cover nearly 100 acres.

Crystal River Rock Co., Leesburg, Fla., is planning extensive improvements to its plant at Cutler, Fla., to cost approximately $125,000. The Crystal company also has a plant at Kendrick, Fla. J. Y. Clark is president.

Monocacy Crushed Stone Co., Bethlehem, Penn., according to a report, suffered a loss of $20,000 recently when its plant was damaged by fire.

Universal Marble Products Co., Thornwood, N. Y., suffered a fire of incendiary origin which destroyed a plant valued at $20,000, on February 14. The night watchman was threatened and fired upon by the thugs who started the fire.

Sand and Gravel

Kentucky River Sand and Gravel Co. is installing a 150-ton per day limestone crushing plant at Tyrone, Ky.

Quincy Sand Co., Camp Point, Ill., according to a local newspaper, "specializes in furnishing the public with whatever kind of sand might be their demands. Mothers need not to fear when an auto honks that their little ones are on the street playing—a sand pile makes contented children and provides play for them in sunshine and fresh air. This particular grade of sand is clean and pure and contains no organic matter." This company's enterprising methods of merchandising might be followed with profit by other sand producers.

Mellen Sand and Gravel Co., Salt Lake City, Utah, is evidently having troubles with its neighbors similar to those of quarry operators. A local newspaper says: "Property owners in the vicinity of Eleventh avenue and B streets, with President A. W. Ivins acting as their spokesman, petitioned the city commission to prohibit operation of a gravel pit at that point. Representing that more than $2,000,000 worth of choice property is owned by the protesting petitioners, immediate relief was asked."

Vancouver, B. C.—Authority was given to execute a new lease of the gravel pit at Coquitlam, by Vancouver and District Joint Sewerage and Drainage Board. Commissioner E. A. Cleveland explained that the board did not wish to work the gravel pit itself. It simply wanted to prevent a combination being formed which might increase the price of sand and gravel. It always, he said, exercised the right to purchase on a competitive basis. I. B. Hewer had agreed to lease the pit, Mr. Cleveland said, and intended to form a joint stock company to work it, with John Bonnycastle, who formerly leased it, and another. He offered the gravel to the board at a flat rate of 10 cents per yard, and undertook not to increase the price from what it was now.—*Vancouver Morning Star.*

Pioneer Sand and Gravel Co., Seattle, Wash., has a contract for gravel for reballasting the Northern Facific Ry. tracks from Carolls to Castle Rock, Wash.

Iron City Sand and Gravel Co., Pittsburgh, Penn., has let contracts to the Jones and Laughlin Steel Co. for several new steel barges.

Penglass Co. at Grayville, Ill., has started building a new towboat for its sand and gravel fleet on the Wabash river. The building of the boat is in charge of Frank W. Ingram, of Paducah, Ky., marine contractor. The dimensions of the new boat will be 64 ft. 10 in. in length by 16 ft., with 22-in. draft and 20-in. freeboard. It will have a scow bottom and the main deck will carry a full cabin. A 120-h.p. Wolverine oil engine will furnish the driving power, which will be transmitted to the stern wheel through transmission and chain drive. An auxiliary engine will drive a generator and large search-light. The boat is expected to be in operation by the middle of March.

Sweetwater Rock and Gravel Co., Sweetwater, Tex., has been awarded what is said to be the largest crushed rock contract ever awarded in this part of Texas by the Kansas City, Mexico and Orient railroad to supply it with between 400,000 and 500,000 tons of crushed rock for the ballasting of the line from Altus, Okla., to San Angelo, Tex., a distance of 256 miles. The work will require four years. Bontke Brothers and A. D. Hoppertz of Abilene own the Sweetwater Rock and Gravel Co., whose contract exceeds $200,000. The rock will be taken from the Bob Trammell ranch near Sweetwater. The San Angelo-Sweetwater division will be ballasted first.

F. R. Walker, Puente, Calif., has purchased the interest of E. R. Long in the sand and gravel business operated under the name of Walker and Long. The plant has been improved and is putting out three grades of sand and two grades of rock and markets its products in Puente, Baldwin Park, El Monte, and Whittier districts.

W. D. Haden and Co., 2315 Polk St., Houston, Tex., are planning doubling the capacity of their gravel plant. Sid Clark is manager.

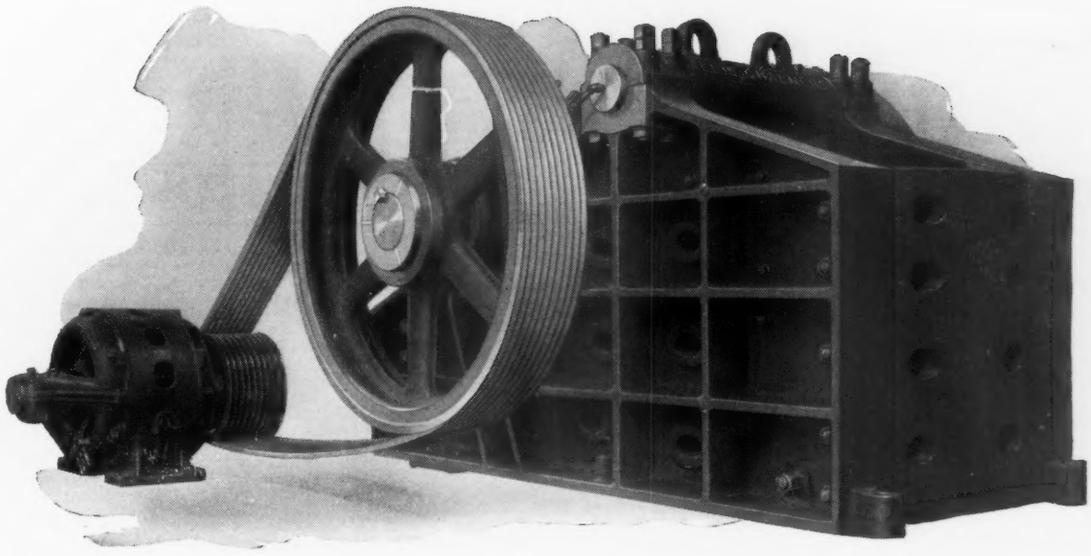
Mobile and Gulf Navigation Co., Mobile, Ala., it is reported, has added 15 steel barges, and new tow boats to its equipment. A complete repair plant and shipyard on Bayou Sarah has also been built by the company, and the shops moved to that point from the foot of Palmetto St. The improvements and new equipment are said to have cost around $175,000.

Kirkpatrick Sand and Cement Co., Birmingham, Ala., has placed in operation a new 200-h.p. Deisel-driven suction dredge, it is said, with a 10-in. manganese pump.

Huntsville Transfer and Building Material Co., Huntsville, Ala., is said to have doubled the capacity of its sand and gravel plant on Hobbs Island by making a number of improvements and adding to the equipment.

Tampa Sand and Shell Co., Tampa, Fla., has installed a new 16-in. dredge at its plant, according to reports, and built a new machine shop and office.

Bedford-Nugent Sand and Gravel Co., Evansville, Ind., docked a steamer digger at Cannelton, Ind., recently, where they will unload 15,000 yd. of gravel for use on the roads of Cannelton and Perry counties. The company now has a digger located on a gravel bar in the Ohio river above Cannelton. But the additional rise in the river the last week in February, which brought the Ohio river again above floor stage stopped the operation of the digger for several days. Gravel and sand men at Evansville say the outlook for building during the coming spring and fall is very hopeful and they are looking for a busy season.



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Cement

Trinity Portland Cement Co., Eagle Ford, Tex., recently shipped an entire trainload, consisting of 1000 tons of cement, to the lower Rio Grande valley.

Dewey Portland Cement Co.—Herbert F. Tyler, first vice-president, headed the program on the WOC radio program, Davenport, Iowa, on February 24 with a talk on "Why We Located in Davenport." The program was given by the Davenport Iowa Industrial Commission to boost Davenport as the "Capital of the Middle West."

Alpha Portland Cement Co., Easton, Penn., is reported to have awarded a contract to the Gates Construction Co., Chemical Building, St. Louis, Mo., for a $100,000 addition to its mill buildings at Continental, Mo.

Superior Portland Cement Co., Concrete, Wash., has resumed operation of its quarries, after a brief shutdown, according to local newspapers, which also state that the cement plant "is now operating to full capacity, which is unusual for this season of the year. The market for cement has been exceptionally good throughout the winter, and the usual reserve of the company has been used up much earlier than expected. The company has some large contracts to fill during 1927, and it is likely that the plant will operate to full capacity for the entire year."

Cement Products

Leslie Lumber and Supply Co., Pine Bluff, Mo., has purchased the Sikeston Concrete and Tile Construction Co. of Sikeston, Mo., operating a general lumber and building material business. The concern will be taken over March 1 under the name of the Leslie Lumber and Supply Co.

Lime

Southern Lime Products Co., Cincinnati, Ohio, has leased for 10 years the property of the Alabama Lime Works, Fort Payne, Ala. The plant has been idle, it is reported, for the past three years. Improvements and additions will be made by the lessee.

Gypsum

California country journals describe excellent results from the use of gypsum fertilizer in reclaiming alkali bad lands.

Talc and Soapstone

Mariposa, Calif.—A group of Eastern men have interested themselves in the large deposits of talc near Bagby and it is understood a number of men have been engaged to make the preliminary arrangements for the shipping out of 200 tons or more of this fine grade material to Eastern and Western manufacturers.

United Talc and Crayon Co., Glendon, N. C., has 88 acres under development and is installing machinery. The daily capacity is to be from 20 to 25 tons. A. L. Luff is president.

Potash

Carlsbad, N. M.—Government engineers and drillers are arriving at Carlsbad, N. M., and machinery is being assembled for the government tests made possible by the appropriation of $500,000 by congress, to be expended at the rate of $100,000 per annum. More important than the government's activities is the apparent intention of the Snowden-McSweeny interests to begin development work under their leases of state land. Their geologist has returned to Carlsbad and begun conferences with representatives of the recently formed New Mexico Potash Co. in connection with test holes now being drilled on the company property. The outlook is for immediate development of potash on the state land and ahead of any work on the government land. The lessees of the state land have ample resources to do this work and apparently intend to go ahead at once.

Personals

Harry J. Larkin, general manager and secretary of the Rock Island Sand and Gravel Co., Rock Island, Ill., was elected president of the Rock Island Coal Club at the annual meeting of the club held recently. Fourteen coal dealers attended the meeting.

K. H. Talbot, recently resigned as manager of cement sales of the Cowham Engineering Co. of Chicago, to accept an appointment with the Koehring Co. of Milwaukee, Wis., as director of sales, in charge of domestic and foreign sales. Mr. Talbot was formerly connected with the Koehring company as manager of field service, covering a period of five years from 1919 to 1924.

John S. McMillan, president of the Roche Harbor Lime and Cement Co., Seattle, Wash., was appointed recently by the foreign trade department of the Seattle Chamber of Commerce to represent that city at the Pan-Pacific Conference in Honolulu on April 11 to 16.

H. E. Hilts, manager of the Virginia Portland Cement Corp., Norfolk, Va., a subsidiary of the International Cement Corp., New York City, recently gave a talk before members of the Hampton Roads Chemists' Club on cement, covering particularly the operation of the plant at Norfolk. Following his address, H. A. Williams, chief chemist for the company, told of the chemical side of the industry.

S. E. Burnham of Boise, Idaho, has been appointed by Morrison and Knudson, Portland contractors, to take charge of the company's commercial gravel plant at Boise.

E. D. Greene, Birmingham, Ala., who has been secretary of the Alabama branch of the Associated General Contractors of America for the past five months, has returned to the district staff of the Portland Cement Association, it is announced, and will resume his duties as field engineer in charge of inspection of all concrete street and highway construction in that state.

M. J. Finneran, Erie, Penn., has been appointed by the Bessemer Limestone and Cement Co., Youngstown, Ohio, to temporarily take charge of its interests at Rochester, N. Y., but later he is to be placed in charge of the mid-southern section of the country with headquarters at Baltimore.

E. S. Black and **A. H. Exton** have rejoined the American Manganese Steel Co., Chicago Heights, Ill. Mr. Black's duties are those of consulting engineer, both mechanical and sales and Mr. Exton is to be chief engineer.

Henry Foott has been appointed sales manager of the Ross Island Sand and Gravel Co., Portland, Ore. Mr. Foott, who was born and reared in Portland, has been identified with the sand and gravel industry at that place for 17 years, the last eight of which were with the Hackett Digger Co.

P. H. Bates, chief of the ceramic division, U. S. Bureau of Standards, was one of the principal speakers at a recent luncheon of the Washington, D. C., Rotary Club. Mr. Bates outlined briefly the exhaustive studies on the structure of portland cement now under way at the bureau's laboratories.

J. E. Zahn, secretary-treasurer of the United States Portland Cement Co., is taking an active part in reorganizing the Sunshine Mission, a charitable institution in Denver, Colo. The institution is in debt about $12,000, but Mr. Zahn says that it is worth many times that in value and must be placed on its feet. Associated with Mr. Zahn are several of Denver's big business men, and what J. E. Z. tackles goes over.

Mark H. Small was appointed as acting district engineer in charge of the Birmingham office of the Portland Cement Association on February 5 to succeed C. C. Jordan, resigned. Mr. Small has been in the Birmingham office since November, 1924. For about a year he was in charge of diversified promotion, then was assigned to street and road promotion in South Alabama and West Florida. He continued in this work until appointed as acting district engineer. Mr. Small has been in road, street and bridge construction work since his high school days. He graduated with C.E. degree from Michigan State College in 1922. While in college he did road and street engineering on the side for various towns in Michigan.

Frank G. Conkling has been appointed assistant sales manager of the Signal Mountain Portland Cement Co., Chattanooga, and will be in charge of the office. Edwin R. Bullard, assistant sales manager for some time past, continues in the same capacity in charge of field work. Mr. Conkling resigned as sales manager of the National Cement Co., Birmingham, the latter part of January, after more than three years of service with that company. Prior to going with the National Cement Co. he was southern sales manager at Birmingham for the Atlas Portland Cement Co.

P. A. Barr, chief clerk of the Signal Mountain Portland Cement Co., has been transferred to the Florida Portland Cement Co. at Tampa, Fla. The Florida Portland Cement Co., like the Signal Mountain Portland Cement Co., is under the supervision of the Cowham Engineering Co. John L. Senior is president of all three companies.

Obituaries

William L. Beddow, Seattle, Wash., an attorney, and one of the organizers of the Sound Sand and Gravel Co., which was sold some time ago to the Pioneer Sand and Gravel Co., Inc., both of Seattle, died at his home, 144 Madrona Place, N., February 15. Mr. Beddow was identified of late with the Pacific Tow Boat Co.

Manufacturers

Pennsylvania Crusher Co., Philadelphia, Penn., announces the appointment of John Alden Plimpton as western manager to succeed C. S. Darling, resigned. Mr. Plimpton is a graduate of Massachusetts Institute of Technology and has had a wide experience in engineering and sales work in various companies.

Chicago Pneumatic Tool Co., New York City, announces the closing of its own offices in Dallas and Houston, Texas, incident to the appointment of Whealton & Townsend, Inc., with main offices at 120 East Brady St., Tulsa, Okla., as distributors of Chicago Pneumatic products in the state of Texas east of meridian 102. Whealton & Townsend, Inc., will maintain sales and service offices in both Dallas and Houston, and will establish additional offices elsewhere when the condition warrants the same.

Patterson Foundry & Machine Co., East Liverpool, Ohio, has announced the program of expansion recently launched by the company involving a million dollar expenditure. The company recently purchased Martin Gardens at Laughlin Station, East Liverpool, Ohio, and has already let contracts for a two-story fireproof building with approximately 50,000 sq. ft. of floor space. This building will be occupied by the general offices, engineering department, laboratories, experimental and pattern making departments. The general offices will be removed to the new building about June 1.

Midwest Fire Brick Construction Co., Detroit, Mich., is incorporating under the laws of Michigan and will specialize in fire brick contracting in the lime, cement and ceramic industries. An office has been opened in the Stephenson Bldg., Detroit.

Climax Engineering Co., Clinton, Iowa, has just completed arrangements with the Koehring Company Associates, 50 Church St., New York City, to handle the sale of Climax Engines, Power Units, and accessories for export exclusively in the following countries: Argentina, Columbia, Italy, Panama, India, Philippine Islands and Japanese Empire. Due to the broad knowledge and experience of the Koehring Company Associates in the handling of products of this nature, the Climax Engineering Co. believes that the best interests of its foreign customers can be served to best advantage through the use of this world-wide organization.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Industrial Equipment. Bulletin of railway, logging, contracting and industrial equipment for sale or rent by the SOUTHERN IRON AND EQUIPMENT CO., Atlanta, Ga.

Lime Kilns. Bulletins Nos. 1 and 2 on Schmatolla kilns for burning lime, dolomite and magnesite. E. SCHMATOLLA, Washington, D. C.

Continuous Filter., Bulletin No. 130 on the American continuous filter for dewatering cement slurry, etc. Details of construction, design, data on operation. UNITED FILTERS CORP., Hazelton, Penn.

Thickeners and Classifiers. Bulletin No. 30 describing and illustrating the Hardinge "Super Thickener and Classifier." Engineering data, details of design, etc. HARDINGE CO., York, Penn.

Air Separation. Catalog No. 87 illustrating and describing air separation methods and equipment. Construction details, specifications, engineering data, etc. STURTEVANT MILL CO., Boston, Mass.

Worm Gear Speed Reducers. Catalog 300 on **IXL** "Hygrade" worm gear speed reducers manufactured by FOOTE BROS. GEAR AND MACHINE CO., Chicago, Ill.

Ganschow Gears. Booklet on origin, personnel and organization of the WILLIAM GANSCHOW CO., Chicago, Ill.

Steam Economy. Bulletin on boiler room operation containing information on systems, equipment to reduce steam costs. REPUBLIC FLOW METERS CO., Chicago, Ill.